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PICKS and SHOVELS

By O. E. POTTER

No Boon-Doggling Here

Dear Picks and Shovels:

That renowned liberal newspaper, the New York *Herald-Tribune*, published in its February 16 issue the item below under a Middletown, Conn., date line with the note, "*Special to the Herald-Tribune.*" It reads:

"An initial move to begin building a $,000,000 bridge over the Connecticut River next spring, to link this city with Portland, has been announced by engineers of the Connecticut Highway Department. A preliminary survey of the river banks is underway and plans for the 3,400-foot steel arch were approved this week by the State Public Utilities Commission.

"Two 600-foot spans and a series of viaducts aggregating 2,200 feet will carry a broad roadway and two sidewalks over the river."

Cheap at any price!

Yours truly,
The Editor.

He Got Religion!

The Minnesota State Highway Department recently received a letter so unusual in the ordinary course of events that we must tell you about it.

"About five years ago I was saved in a revival of religion," a resident of Cass County, Minn., wrote the highway department. "Since that time I have been cleaning up my past life. About the year 1927, I took a steel stake from Highway 19. I ask that the highway department forgive me this deed which I have done. I am willing to pay the cost of the stake."

The penitent was notified that, in view of his remorse, he has the complete forgiveness of the State Highway Department.

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C. & E. M. Photo
The Line of Pneumatic Caissons at Quabbin Dam, Enfield, Mass.

Now is the time for all friends of good roads to come to the aid of the highway program. And the proper method of approach is through organized rather than individual effort.—
Charles M. Upham.

Pneumatic Caissons Sunk for Core Wall Of Quabbin Dam

(Photos on page 44)

The Two Companies, Inc. Produce Own Aggregate, and Mix Concrete at Site of New Water Project

SINKING narrow concrete boxes 9 feet wide, 45 feet long and exceeding 120 feet in height, and keeping them aligned and in plumb was the task of A. R. Terwilliger, veteran of many pneumatic caisson contracts, who is Superintendent for The Two Companies, Inc., on the core wall of the main dam of Quabbin Reservoir near Enfield, Mass.

This project of the Metropolitan District Water Supply Commission of Boston will furnish additional water supply for the twenty communities including Boston which comprise the District. The Metropolitan District Water Supply Commission was created in 1926 to secure a new supply from the Ware and Swift Rivers. Work already completed includes the 24.6-mile Quabbin tunnel aqueduct from the Quabbin Reservoir to Wachusett Reservoir, and the Ware River connection to this tunnel at a point 14 miles from the Wachusett Reservoir.

A Core Wall of Caissons

The concrete core wall for the main dam was formed by sinking a series of pneumatic caissons measuring 9 x 45 feet in plan and spaced only 18 inches apart with keyways at the ends. These caissons, sunk under air pressure, were carried to bed rock, then the keyway between the caissons was excavated, sealed with concrete and a rolled impervious core embankment placed next to the caissons. The caissons were carried to 25 feet above the bottom of the open cut trench which was approximately 30 feet deep.

Three exploratory caissons were first carried down under special contracts, the contract of The Two Companies, Inc., calling for the sinking of the remaining 37 units. The caisson shoes of special steel measure 9 x 45 feet and comprise the cutting edge at the outside lower edge of each caisson. The concrete walls of each caisson are 9 inches thick at the bottom and increase in thickness to 2½ feet at the top of the working chamber which is 6 feet 6 inches high. Each caisson has three 4-foot diameter cylindrical wells, the center of which was the man-way and the two end wells were used for mucking.

Blaw-Knox steel panel forms 22½ feet long and 8 feet high were used. The forms were held in line with 1⅜-inch tie bolts with screw couplings located 1 foot back of the face of the concrete. Each lift was 16 feet high, requiring 208 cubic yards of concrete. In stripping the forms, panels 22½ feet by 16 feet in size were removed as single units.

There are fifteen 1-inch vertical round

(Continued on page 22)

Old Texas County Road Rebuilt With Plant-Mix

Brown & Root, Inc., Spread Plant-Mix Base and Top With Machine on Houston Project

OLD Liberty Road, a section of the original highway between Houston and Beaumont, Texas, entering the City of Houston from the north, was abandoned in 1930 for a new concrete highway running via the Ship Channel and Turning Basin at Houston. Since traffic continued to be heavy on the old route, PWC Project 5273 was instituted to rebuild the old county road with a plant-mix base and top.

Concrete headers 9 inches wide and 12 inches high were built with ready-mixed concrete at either side of the 18-foot road for the full 4.526 miles. A 6-inch reconstructed gravel base was laid, over which the 2-inch plant-mix asphalt base was spread and topped with a 1-inch surface course. The asphalt base course had a 2-foot x 6-inch wedge of the plant-mix material against either curb, and the top and base carried a 2-inch crown. French drains were laid across the shoulders staggered every 100 feet with 6 x 6-inch cross section.

Plant Located at Middle of Job

A complete aggregate handling and mixing plant was set up at the middle of the job. The Amulco Asphalt Co. of Texas furnished the emulsified asphalt from its plant in Houston. This material was hauled to the plant in tank trucks and stored in an 8,000-gallon tank until used. The breaking time of the emulsion was controlled by the amount of saponifying agent used in the emulsion.

Aggregates were brought in to the plant over an old relaid industrial spur and unloaded to the stockpiles or to the Blaw-Knox batching plant by a P & H 206B crane with a 1-yard clamshell. Sand came from Eagle Lake and the stone from New Braunfels, Texas. The individual batches for base and top were made up as shown below, two batches making a single truck load. Base stone was mixed ½ to 2-inch screen size with an average of 2,463 pounds to the batch, and about 150 pounds of sand, the whole being mixed with the asphalt emulsion, giving 3.64 per cent net asphalt. For top the stone was ⅝ to ¼-inch with 2,147 pounds to the batch and 375 pounds of sand and 5.27 per cent asphalt content.

The batches of aggregate were weighed out and dumped onto a 90-foot conveyor with an 18-inch belt which carried it to the mixer hopper where it was held until the mixer was clear. Thus three batches could be in process at one time. The mixing time was about three minutes. An old 3-yard Smith tilting cube mixer was used for the mixing. A Buda 4-cylinder 84-hp gas engine operating at 900 rpm furnished power for the conveyor and mixer.

A steel drum with a welded extension was used to measure the amount of asphalt for each batch. It was transferred to the batch by a Goulds rotary pump. A depth of 25.2 inches of emulsified

(Continued on page 10)

C. & E. M. Photo
The Aggregate and Mixing Plant Used by Brown & Root, Inc.

Brick Highway Improved by Contract and FERA

Nebraska Road Repaired by State and Widened to 42-Foot Highway by Yant Construction Co.

AN unusual combination of relief and contract work in which a birdseye view of the job looked like a patchwork quilt during construction was seen west of Omaha, Nebr., on U.S. 30-S, Project NRH-20-ACF. The entire project cost $308,000 for grading, paving, drainage and a viaduct, exclusive of materials and supervision furnished by the State on work done with relief labor. The old highway was brick surface 16 feet wide on a concrete base with a 12-inch concrete curb on each side. This formed the nucleus of the new widened roadway.

The project was 4.8 miles in length, of which approximately one-half of the old pavement was removed and replaced with 42 feet of new concrete pavement. The balance of the old brick which was left in place was widened from 18 to 42 feet by placing concrete pavement on each side of the old pavement.

The reasons for removing the sections of old pavement were to improve the grade line, lengthen sight distances and correct alignments. The brick on the old 18-foot pavement which remained in place was taken up and relaid with FERA labor to improve the riding surface. Portions of the base course on these sections which were in poor condition were replaced by state equipment and materials, using relief labor.

The contract awarded to the Yant Construction Co. called for pouring some 42-foot new pavement in 21-foot strips but most of the work was the widening of the existing 18-foot pavement with slabs varying from 8 to 12 feet. Most highways in this section of the country are laid out on section lines with some variation, causing heavy lines in the foreheads of designing and construction engineers. The old brick highway was supposed to have been laid out on the section line but when construction was under way it was found that strips poured according to the old surveys failed to meet when coming from opposite directions. This was caught in time and readily corrected by pouring a wider strip on one side and a narrower strip on the other at the transition section.

Another unusual feature of this project is that the old 12-inch concrete curbs were removed after the pavement was completed. This gave further employment to relief labor and allowed the curbs to remain in place as tracks for the finishing machine during the pouring of the widening strips. The contractor used iron plate to make up the difference in elevation of the curb and the brick. Due to the uneven surface of the brick this course was taken; otherwise the new concrete pavement would have required an excessive amount of attention from a grinding machine along the inner edge.

Construction Organization

The widening strip was cored out with graders ahead of form setting. The 10-inch Blaw-Knox steel forms were set by two men per shift as there was only one line on widening. Two men hand-cleaned the form trench after it was cut by a Ted Carr Formgrader and two others tamped the form base to give a firm bearing. Grading between the forms was handled by six laborers shoveling out the dirt windrowed by a Warco power grader and scarifier. High spots were pulled out and low spots filled with a rotary scraper pulled by an Allis-Chalmers tractor. The final grade was rolled to smoothness by a Huber 10-ton roller.

The contractor used two pavers for pouring the widening strips and also for the 21-foot paving where the full width of 42 feet was laid. A Koehring 27-E paver ran on the grade and poured twenty-one batches for the lower 6 inches of the slab, then the steel men put in the wire mesh reinforcing and the Rex 27-E poured the nine top batches for the same area. The latter ran on the old pavement. A strike-off of railroad iron mounted on wheels running on the form and curb was pulled 20 feet behind the Koehring paver to give an even surface for placing the reinforcement. A 21-foot finishing machine followed the pavers on each 21-foot strip of the 42-foot pavement.

The Blaw-Knox batcher plant equipped with a Howe scale was located at the west end of the paving and all aggregates were delivered by bottom-dump trucks delivering to a pit covered with a grating. A Koehring crane with a 40-foot boom and clamshell handled the aggregates direct from the pit to the bins or to a stockpile. Bulk cement was used.

A Lakewood finishing machine with variable span finished the slab, followed by two men on the longitudinal float and 12-foot straight-edge and two others on long-handle floats and belts. Three men worked on lip curb which was finished with a canvas drag to give a uniform surface like the pavement.

Personnel

The contract work was done by the Yant Construction Co. of Omaha, Nebr., under the direction of Dick Dugdale, General Superintendent, with Jess Sell as Field Superintendent. A. D. Morrell was Resident Engineer for the Nebraska Department of Roads and Irrigation.

C. & E. M. Photo

Lowering a 24-Inch Reinforced Concrete Pipe With an A-Frame and Hand Winch

Laying Concrete Pipe for New City Sewer

H. E. Miller, of Columbus, Had 2,790-Foot Section of Concrete and Clay 30, 24, 18, 15-Inch Pipe

IN a section with a large amount of shale and clay which stood in a vertical face, making sheeting a matter of precaution instead of necessity, H. E. Miller of Columbus, Ohio, placed reinforced concrete and vitrified clay pipe in trenches from 12 to 17 feet in depth in Columbus, Ohio. The sheeting was miscellaneous sizes of planks up to 2 x 9-inch stock on about 8-foot centers and held with Simplex trench braces. The trench was excavated about 4 feet wide with a Keystone pull shovel and the bottom trench for the tile underdrain and all the shale was broken up with a jackhammer operated by a Sullivan air compressor.

Setting the Pipe

The pipe was set by hand with an A-frame of 4 x 4-inch timber and a Sasgen hand winch used to snub the pipe as the planks across the trench were removed and the pipe lowered into the trench. The pipe was set on concrete blocks, one to each length to insure the correct grade. A cradle was poured under the 30-inch pipe and concrete backing was poured to 3 inches above the horizontal diameter of the pipe where the fill was more than 10 feet in depth over the top of the pipe. The concrete for the cradle and backing was furnished by a local ready-mixed concrete company and delivered in Jaeger truck mixers. The grout for the bell and spigot joints was mixed in a small Jaeger mixer.

Six-inch underdrains were laid ahead of the pipe, 1 foot below the bottom of the pipe and covered with 4 inches of crushed stone at the sides and top. Water for puddling the backfill was pumped from the underdrain with a Barnes duplex pump. The backfill was pulled in with a pair of Parsons power backfill machines and trimmed by hand. The bottom backfill over the cradle and backing was usually material just removed from the trench ahead and trucked back. The excess was left in a continuous spoil pile along the trench.

This contract was operated under the PWA with a 30-hour week and an 8-hour maximum day as allowed by the Ohio state law. The quantities of the various sizes of pipe were as follows:

30-inch concrete pipe	1,310 feet
24-inch concrete pipe	620 feet
18-inch vitrified tile pipe	810 feet
15-inch vitrified tile pipe	50 feet
Total	2,790 feet

Personnel

H. E. Miller of Columbus, Ohio, was the contractor for this section of the sewer project now underway through Public Works loans, with H. M. Bright as Superintendent. For the city of Columbus the work was under the general supervision of the Division of Engineering and Construction, of which P. W. Maetzel is Chief Engineer, with O. Bonney, Sewerage Relief Engineer in charge of the design and construction of sewers, D. T. Mitchell, Chief Field Engineer, in charge of construction and A. M. Mock, Engineer in charge of this section. John H. Gregory is Consulting Engineer for the City. The PWA was represented by L. A. Boulay, State Engineer, and J. B. de Hamel, State Engineer Inspector.

First and Last Cost in Tractor Operation

Another proof that a higher initial first cost may produce a lower unit cost was furnished by A. J. Ackerman, Construction Plant Engineer, Tennessee Valley Authority, in his paper presented before the Construction Division, American Society of Civil Engineers. He compared two tractors as regards first cost, repairs, operating costs and working hours on comparable operations.

One of the tractors cost $5,000 and the other $4,000 which would place the second in a lighter weight class than the first and hence subject to greater destructive strain when engaged on comparable work with the more expensive tractor. The first tractor required $1,288 spent in repairs and the less expensive tractor, $3,283.

The first tractor worked 5,353 hours at a cost of $8,606 for operation while the second tractor worked 4,814 hours at a cost of $7,676 for operating costs alone. The fewer working hours of the second tractor were due to the time out for repairs.

Totaling the first cost, repairs and operating costs for the more expensive tractor and dividing by its total working hours, we get a unit cost per working hour of $2.78 while for the less expensive tractor the unit cost is $3.11.

HEY? WHAT'S GOING ON BEHIND THAT WALL?

A Skillful Shovel Operator is Just Spotting and Dumping a Bucketful of Dirt on the Far Side of the High Concrete Wall. See Page 44

DON'T LET THEIR LOW COST MISLEAD YOU!

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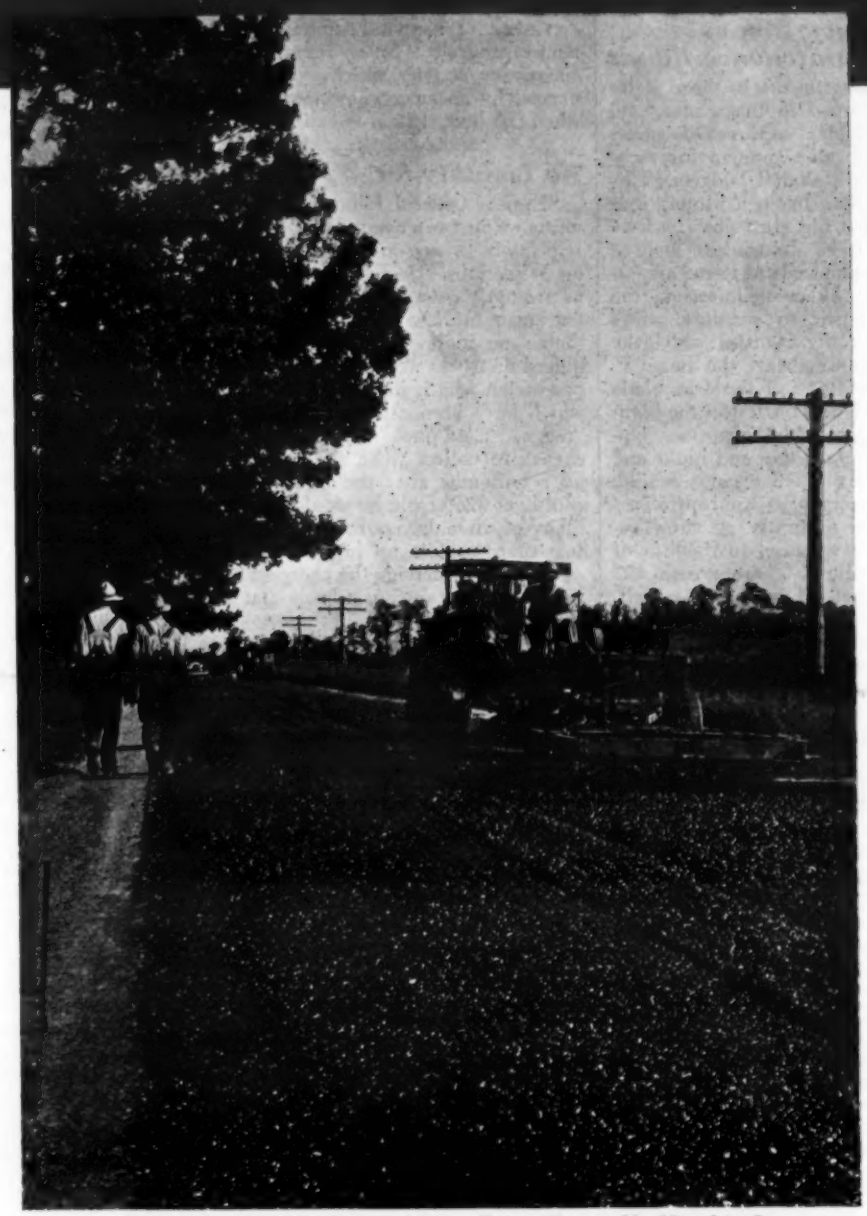

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Separate Snow Money and Maintenance Funds

Highway departments in those states afflicted with snow in the winter, and this even includes sections of sunny California, set aside an item for snow removal in their annual budgets. This item is a gamble. In open winters it is too large and a big slice goes back to the general funds. In winters such as 1935-36 when hundreds of towns are cut off from highway communication, the departments hurry to purchase more equipment, the big rotaries whirl the snow from the roadway, the huge V-plows buck drifts, and the fast blade plows race back and forth over the highways to keep pace with the storms. Operations are pressed day and night and the budget figure is left leagues behind. Additional emergency appropriations must be made promptly as snow removal today is essential to the life of rural communities. There are 48,492 communities, not all in the snow belt, without any rail facilities and dependent solely on truck transportation.

This past winter has shown how dependent the modern rural family has become on its road system, where freshly baked bread is delivered daily from the large cities to the general store in the smallest hamlets, where families no longer have a barrel of flour in the shed.

Snow is an expensive luxury, it delights in piling deepest where it is most difficult to remove, but its removal provides an income for the state because, like the Chinese laundryman and his "no tickee, no shirtee," it is a case of "no clear road, no gas tax." The gas tax income, or what is left after the wholesale diversions of the politicians, is the life blood of the highway departments.

It cost a million dollars to keep the roads of Minnesota open this winter and that came out of a total maintenance budget for the year of only $6,600,000. If the highway department had not fought to keep the trunk highways open, drawing heavily on maintenance funds to do so, there undoubtedly would have been general disruption of business and economic life throughout the state as well as widespread suffering, according to State Highway Commissioner N. W. Elsberg. Without open highways, the great twin cities of St. Paul and Minneapolis and other cities would have been cut off from milk supplies and the smaller towns would have run short of food and other necessities.

Regular maintenance money should not be used for snow removal to the detriment of the vital summer maintenance program. Snow removal is an emergency activity which should be financed by an emergency appropriation when the budget item is exhausted.

No Liability for WPA Trucks

"Even if General Johnson did say we must, we just can't pay $1.55 a day for liability insurance on our trucks working on WPA jobs. Uncle Sam doesn't pay us promptly enough," argued a group of truckmen in New York City. So, now there's no more liability insurance required on trucks working for WPA. The pedestrian who is hit by these machines which have been called in many cases, "reconstructed junk," hasn't a ghost of a chance to collect when the case comes up six months after the injury. If he could get $250 cash, he would be lucky. Many of these drivers borrow money or sometimes are set up in business by a district leader, buying the cheapest automotive vehicle on four wheels that will still run.

Then consider what this has done to responsible truckmen who feel that they must pay the $409 a year on each of the 5 to 7-ton trucks for $10,000 to $20,000 insurance against personal injury and $5,000 property damage. The Government requires that owners pay a driver 75 cents per hour or $6.00 a day plus 72 cents a day for compensation if the contractor has other property or capital he wishes to protect. Gas and oil cost $2.25 a day and the insurance $1.55 a day. Add to these depreciation on tires and trucks, garage rent and other overhead and you can see why contractors must bid up to $25.00 a day for the use of their trucks on WPA jobs, if they are responsible.

The irresponsible truckman who is chiseling on the wages he is paying to his driver now is relieved of the responsibility of carrying liability insurance so he can bid around $13.00 or less and still clean up. General Hugh Johnson when he headed WPA in New York City in September, 1935, required that every truck carry liability insurance. His efforts to protect pedestrians, other motor vehicles and responsible truckmen lasted just three months. Today, WPA trucking is wide open for the irresponsible operator.

This same situation may appear in other communities. We therefore urge all contractors' organizations to take steps immediately, through state and Federal WPA offices, to rectify or prevent the spread of such an insidious practice.

Two New Publications for Highway Users

Two additions to the Highway Users Series have recently been published by the National Highway Users Conference. No. L2 in the series, entitled "Registration Fees and Special Taxes for Motor Vehicles," presents in charts and tables authentic information on the taxes levied upon the motor vehicle owner and operator in each of the states as of January 1, 1936.

The other volume, L3, "Equipment Requirements for Motor Vehicles" was prepared to provide up-to-date and authentic data on mandatory equipment for motor vehicles as prescribed in each state.

Copies of these books may be secured from the National Highway Users Conference, National Press Building, Washington, D. C. The price of No. L2 is $1.25 and of No. L3, $1.00.

R.R. Crossing Experiment Successful But Costly

To the Editor
Contractors and Engineers Monthly

With reference to an article in the January issue of CONTRACTORS AND ENGINEERS MONTHLY regarding monolithic railroad crossings built in the City of Kenosha, Wis., we submit the following:

The resurfacing of three industrial track zones of the Chicago and North Western Railway was a part of the work done by Robert L. Reisinger Co. of Milwaukee in the paving of Sheridan Road, a 56-foot street, forming a connection for State Trunk Highway No. 42 in the City of Kenosha. This project was financed with Federal funds and is known as U. S. Public Works Project NRM No. 540-A and was done by a contract with the State Highway Commission of Wisconsin, the engineering and supervision being done by Commission employees from the Division Office in Milwaukee. The work of changing rails, ties, signals, and renewing ballast was performed by forces of the railway company under a special agreement and was paid for with Federal funds.

There was no interference with rail traffic but due to the fact that other portions of the street were not completed, vehicular traffic was diverted over the established detour. However, to minimize inconvenience and to make these crossings available at the same time that the street proper was opened, high-early-strength cement was used for the paving of the track zones.

In accordance with regulations under the contract, labor was obtained from lists furnished by the National Reemployment Office.

As called for on the plans, ballast furnished by the railway company consisted of crushed stone not more than 5 per cent being less than ¾-inch and the maximum 2½-inches in size placed to a depth of 12 inches below the bottom of the tie.

The grouting mortar consisted of a mixture on the proportions of 1 cubic foot of cement to 2½ cubic feet of sand graded from zero to all passing a No. 8 sieve and from 7½ to 9 gallons of water to produce a free flowing mixture that would penetrate to and fill the voids in the ballast. The grout was applied between a pair of adjacent ties until it appeared near the top of the ballast ahead of the forward tie. When this was done so that the grout appeared between all of the ties, a monolithic slab of the same proportions as used in the street paving was cast in place. The total track zone improved was 397 feet long and 10 feet in width.

Because of the experimental nature of these grouting operations, we were unable to obtain a fixed price for this type of work and it was necessary to make an agreement with the contractor on a cost basis. For the grouting operations, costs were as follows:

Labor	$123.39
Materials	464.61
Equipment	53.30
Overhead	88.20

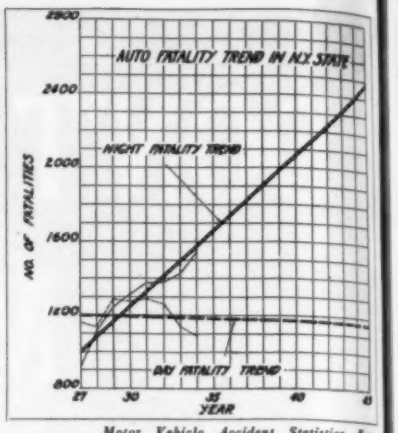
This gave a total cost of $729.50, or $1.84 per track foot. The monolithic slab was placed at the same price as that for regular street paving plus an additional cost of $0.30 per barrel for high-early-strength cement. The total cost of this slab was $1,049.00 or $2.64 per track foot. Thus the total cost of all the concreting operations performed in the track zone amounted to $4.48 per track foot.

While the exact costs are not yet available, records on hand indicate that work done by the railway company forces in excavation, changing ties and rails, and in ballasting operations will run in excess of $3,000.

There is no doubt that as a result of this method we have crossings with superior riding qualities because the rails are maintained at the same elevation as the adjacent street pavement. However, considering the cost, we doubt very much whether the use of this type of construction will become very general. These crossings were more or less experimental on our part. It is our opinion that, judging from past experience, as good a crossing can be obtained at less cost by superimposing a reinforced concrete slab on a well-graded, well-compacted gravel or stone ballast.

We trust that the above will be of some interest and a source of information.

JOSEPH A. STRANSKY,
Division Engineer,
State Highway Commission of Wis.



Motor Vehicle Accident Statistics From New York State Bureau of Motor Vehicles

Adequate Highway Lighting Will Drive the Night Fatality Trend Down.

Does Highway Lighting Reduce Night Accidents?

Several detailed analyses have been made to determine what proportion of the night accidents may be attributed to various causes. Briefly, the conclusion has been that while such factors as fatigue, drinking, carelessness, all play an appreciable part in the greater hazard at night, darkness—that is, lack of adequate visibility—is the major difference in the night condition. This conclusion has been verified by accident experience on highways where lighting according to past practice was often inadequate. For example, on two installations in upper New York State, after lighting was installed, the night accidents decreased 36.4 per cent, although day accidents increased 9.7 per cent along with increasing traffic. On Bay Shore Highway, California, night accidents decreased 40 per cent after the lighting was installed. Coroner Leland of San Francisco County states, "A large proportion of the deaths and injuries suffered in accidents on San Francisco streets and highways at night were preventable if the thoroughfares had been properly lighted."

In New Jersey, on a test of one lighting installation among some sixty throughout the State, the accident rate was less by night than by day; on the adjacent unlighted roads the accident rate by night was over three times that by day.

Kirk M. Reid, General Electric Co., Cleveland, Ohio, in a paper presented before the American Association of State Highway Officials, offers evidence from localities where lighting has been reduced or discontinued. In lower New York State the standard of lighting was reduced in two installations, and the night accidents increased 37 per cent. On the Mt. Vernon Memorial Highway, after the lighting was discontinued, the night accidents increased 144 per cent.

In view of the great improvement in visibility provided by the newest developments in highway lighting, not available when the above installations were made, Mr. Reid estimates conservatively that fully one-half of the present highway accidents at night would be prevented by safety lighting.

A Steel Overpass of Novel Design

(Photo on page 44)

M. E. Gillioz, Contractor, Erects Structure with Superelevated Curve and Stiff Spans

A 343-foot steel overpass to carry the 42-foot roadway of U.S. 24 and two 5-foot sidewalks over the Kansas City Southern Railroad tracks in Sheffield, a suburb to the east of Kansas City, Mo., provides some interesting features of design and construction. The structure contains four stiff frame spans and five swing spans, the former varying from 32 to 46 feet and the latter uniformly 19 feet 6 inches carried by the 12-foot 3-inch cantilevers of the stiff spans on pins.

The piers and columns of this overpass are in line with the bridge on a 28-degree skew with the base line columns and the curvature is taken care of entirely by the variation in the length of the overhang of the side brackets. The grade of the bridge is on a 700-foot vertical curve between two 6 per cent grades. The superelevation of the roadway is taken care of by the variation in the heights of the columns. Practically every piece of structural steel in the entire overpass required a different template for laying it out.

Foundation and Abutments

The footings of the piers are carried on concrete pile foundations of octagonal piles of 16-inch cross section and from 40 to 48 feet in length. The top 2 feet of the reinforced concrete foundation piles was stripped and the steel carried into the footings. The step footings are 9 x 12 feet for the 3-foot bottom step and the top, also 3 feet high, is 8 x 9 feet in plan. Each pier has a collision wall 3 feet 6 inches to 7 feet 6 inches high and 9 x 2½ feet in section with semi-circular ends.

The west abutment is open with the fill retained by a low concrete wall to give more roadway clearance. The approach fill was taken from borrow pits located at the west end of the structure, using an elevating grader and crawler wagon outfit. The borrow pits are to be used by the Sheffield Steel Co. as dumps so that there will be no low area nearby to collect water and serve as a breeding place for insects.

Structural Work

A 2¾-inch bearing plate resting on the footing carries the rocker base of the steel columns. A 2½-inch pin set 2 inches into the bearing plate runs into the column base 1 inch to prevent lateral movement. The column base is 11 inches square and the column spreads to 25½ inches square at the top. The other structural members are all plate girder construction.

The structure is on a 2-degree curve and the superelevation is 0.0286-foot per foot of width or 1.2 feet for the 42-foot width of the roadway.

C. & E. M. Photo

A Section of a New Overpass East of Kansas City, Mo., Showing the Superelevated Curve

Quantities

Class 1 excavation	650 cubic yards
Concrete, Class A, 1:2:3	46 cubic yards
Concrete, special high strength	500 cubic yards
Concrete, Class B, 1:2:4	607 cubic yards
Reinforcing steel	211,656 pounds
Structural steel	544,600 pounds
Wrought iron blast plates	3,900 pounds
Concrete piles	7,100 feet
Concrete pile cut-offs	666 feet
Contract price of substructure	$26,481.25
Contract price of superstructure	54,947.50

Personnel

A. Moret was Superintendent for the contractor, M. E. Gillioz of Monett, Mo., and G. D. West was Project Engineer for the Missouri State Highway Department, with M. J. Snider, Bridge Inspector. H. M. Werbitzky is Division Construction Engineer.

Hydraulic Control Hose

The B. F. Goodrich Co., Akron, Ohio, has recently announced a complete line of hydraulic control hose for use on dump trucks, snow plows, graders and similar equipment.

It consists of a specially compounded oil-resisting rubber tube; one, two or three plies of exceedingly strong braided wire, with a layer of braided cotton and a rubber cover. In sizes ¾-inch and larger, a layer of cotton duck is imbedded in the rubber tube to prevent the development of pin hole leaks. All braids of wire and cotton are inserted in rubber.

Owing to the method of braiding, this hose bends easily when pressure is applied and remains pliable at normal working pressures. It is so designed that it elongates slightly under pressure, thus preventing any tendency to pull out of the couplings. The wire braid, which is exactly laid, allows flexibility but does not permit rotation or torsion, according to the manufacturer.

Goodrich hydraulic control hose is available in sizes ranging from ⅜-inch to 1¼ inches. A permanent pressed-type coupling is recommended and supplied by the manufacturer, but the hose construction permits the use of any of the standard detachable types.

for RUSCIANO & SON CORP.

IN 1934 this New York firm bought its first Northwest Shovel. You be the judge of the kind of service it rendered.

The satisfaction of Rusciano and Sons Inc., is proved by their purchase of two more Northwests in 1935.

One out of every three Northwests sold is a repeat order.

NORTHWEST ENGINEERING CO.

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BUILT IN A RANGE OF 15 SIZES — 3/8 YD. CAPACITY AND LARGER

A Recipe for Roads Built With Salt

Experimental Sections in Ontario, Canada, Warrant Fair Trial as They Have "Shown Enough Stuff"

"TAKE two tons of plain, common salt; mix with so many parts of clay; stir briskly and serve." This is the recipe which the Ontario Department of Highways is using as a road formula and they didn't find it in a cook book. Hon. T. B. McQuesten, Minister of Highways, Ontario Department of Highways, when questioned by the *Toronto Globe*, on the work being done by his engineers, merely replied, "Oh, it's just something they're working on."

The facts are that the road engineers are doing some very interesting experimental work on gravel roadways stabilized with salt, about 12 miles outside of Toronto. When completed, the highway is dark grey in color caused by the moisture held in the clay by the salt. By placing the correct amount of dampened clay in the surface with the gravel, the clay binds the gravel and prevents the formation of the well-known corrugations in standard gravel roads.

Wiping Out Dust Clouds

The object of the work in Ontario is to eliminate the unpleasant dust clouds which hover over a gravel road in the middle of August. Dust means disintegration of a gravel road. According to the report from the *Globe*, treatment with calcium chloride was tried and it kept the road damp. Clay was added and it worked well in dry weather but it was not as successful when it rained. This led to the adoption of salt in the present experiments. A calcium chloride mixture was tried extensively in northern Ontario but salt was first tried on a serious scale in the spring of 1935. The reason salt is used is that it can be bought for $6.00 a ton. The experimental factor enters in the determination of the proper percentage of salt, clay and gravel and to find out if the combination will hold up under an Ontario winter and not be too slippery when it is raining.

Reports From the States

The Ontario authorities have closely followed the work which has been done in the United States in New York, Michigan, Vermont, Maryland and other sections of this country. Salt stabilized roads are providing hard-surfaced, non-skid highways at one-third the cost of asphalt and one-twentieth the cost of concrete. Ontario engineers are not talking costs yet, but they have reported that a good gravel highway can be stabilized with salt for less than $1,000 a mile.

New Bituminous Paver Lays Plant-Mix Surface

For laying low-cost roads that will ride easily, the self-propelling Jaeger bituminous paver has been developed for handling all types of hot and cold plant-mix materials. It is mounted on long equalizing straight-edge runners or movable forms which carry no weight other than the screeds. Features of this paver, made by The Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio, are its easy adjustability for widths from less than 9 up to 14 feet, a greater density of finished surface due to the use of a pug-mill for remixing and for controlling the speed, and the latest type of semi-crawler wheels with increased traction, permitting up to 35 feet per minute finishing speeds without rutting or tearing of the surface. It has a capacity up to 1,000 tons a day because of this high working speed and its ability to lay wider lanes. Maximum traction for speed and grades is insured because all four wheels operate on hard subgrade. Only the runners and screeds touch the newly-laid material, eliminating slipping and tearing of the new surface.

The Jaeger Bituminous Paver for Laying Plant-Mix Materials

Economies of operation claimed by the manufacturer include one-man control with differential steering and less need for joint work or hard labor back of the machine due to its ability to blend center joints, lay flush to the curb, and successfully meet many other job conditions.

Gasoline Crawler Tractors for Heavy-Duty Service

Allis-Chalmers Models K and W-K tractors, made by the Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee, Wis., are husky powerful crawler units built for heavy-duty service on earth-moving, construction and industrial jobs.

Balance of weight, horsepower and speed are features of the design of these models. A modern powerful engine, delivering 49 hp to the drawbar, built into a rugged chassis, transmits power through a simple gear train and clutches. Speeds are synchronized in relation to power and weight, providing a range of useful speeds, four forward and one reverse.

The general design of the K and W-K models is identical, with the exception of minor changes in the W-K which increase the distance between tracks, permitting the use of wider than standard shoes for various special applications requiring extra stability and power or lower ground pressure.

P & H Motor Sales Division Has New Sales Manager

Harnischfeger Corp., Milwaukee, Wis., has announced the appointment of Charles R. Surface as Sales Manager of the P & H Electric Motor Sales Division. Mr. Surface was formerly with the Sprague Electric Works of the General Electric Co. and later connected with the Westinghouse Electric & Mfg. Co., in the Industrial Division of the Chicago District Office. He is now located at the home office of Harnischfeger in charge of sales covering the complete line of P & H motors and electric plants.

Earth Moving Methods in Days to Come

Speaking before the Construction Section, American Society of Civil Engineers, T. T. Knappen, Chief, Engineering Division, U. S. Engineers Office, Zanesville, Ohio, after describing the history of earth moving from the first wheelbarrow to the modern, almost complete mechanization of excavation and hauling, took a look into the future and prophesied an increasing specialization in small units. He believes that equipment will be more extensively mounted on low pressure tires and more attention will be paid to the roads over which the loads are hauled to permit the use of rubber tires on all tractive units. A wider use will undoubtedly develop for the power scraper on short haul work and their radius will be extended.

Mr. Knappen feels that diesel power will take the place of gasoline power on all except the very small units and in a few years even may include these. Increasing specialization in equipment use will probably develop a greater field for the construction consultant who will plan the earth moving equipment setup for large jobs.

Today there is too much overhead going into high pressure salesmanship with resultant credit losses. Equipment manufacturers in the future will tend to combine in order to provide a complete line of equipment, according to Mr. Knappen, and will follow with technical services in job planning to eliminate their present credit wastes and to strengthen their customers' financial position.

Trailer-Type Distributor for Road Oil or Asphalt

The Brown-King distributor for road oil or asphalt which was exhibited at the Road Show by the King Road Equipment Co., 2694 University Avenue, St. Paul, Minn., has a capacity of 2,500 gallons, from two to five times that of other distributors, in order to make possible operations as much as 150 miles from a base of supply. Because of this, it is possible to treat thoroughly a long mileage of highway economically and efficiently, says the manufacturer.

The unit is mounted on eight wheels and is attached to a tractor. A special criss-cross axle with ball joints on either end has been developed for use as the rear axle of this distributor to give flexibility and sturdiness. A double-acting fifth wheel is included for attachment to the truck-tractor. The landing gears for supporting the front of the tank when the truck-tractor is removed are screw jacks, making it easy for one man to operate them.

The tank is fully insulated to reduce loss of heat to a minimum on the long hauls made possible by the size of this new distributor. The series of valves at the rear permit any kind of pumping, from or to the distributor, to the 22-foot spray bars, or for circulation in the tank. There is a strainer on the intake to prevent clogging of the pump. The spray bars are controlled independently or together, depending upon the arrangement of the valves, and the spray bars are cleaned by sucking the asphalt back into the tank instead of blowing. A gage on the tank is calibrated to 50 gallons so that the operator knows the amount of asphalt delivered to the road.

Six-Yard Dredge Bucket of Built-Up Welded Top

A dredging company recently called upon the Wellman Engineering Co., 7012 Central Ave., Cleveland, Ohio, to design and build a new 6-cubic yard power-arm type of Williams clamshell dredging bucket to withstand the extremely severe service encountered in under-water excavation in harbor work. The complete bucket is over 17 feet high and it weighs, when empty, 30,000 pounds.

In designing and building the bucket, it was found that the most practical way to insure the increased ruggedness was the adoption of all welded parts in place of the customary castings, utilizing at the same time the most modern high-strength, low-carbon, alloy steels available, which have the desired physical values for satisfactory welding fabrication. This construction permitted a lessening and a better distribution of the weight, with added strength where most needed.

A 6-Cubic Yard All-Welded Williams Dredging Bucket

District Office Moved

Link-Belt Co., Chicago, Ill., has announced that in order to handle increasing business its district sales office in St. Louis, Mo., has been moved from 3638 Olive Street to 1018-21 Loudernan Building, 317 No. 11th Street, thus providing larger quarters in the heart of the St. Louis business district. Howard L. Burdon is District Sales Manager.

High speed automobiles, the evolution of the tire industry, the frightful loss of life, blow-ups on highways, terrifying skidding conditions and the indifference of police and certain highway officials cause us to pause in horror and wonder what will happen next on our national highways.—Samuel Eckels, Chairman of Board, Allegheny County Authority, Pittsburgh, Pa.

Change of Address Slip

Contractors and Engineers Monthly
470 Fouth Ave., New York

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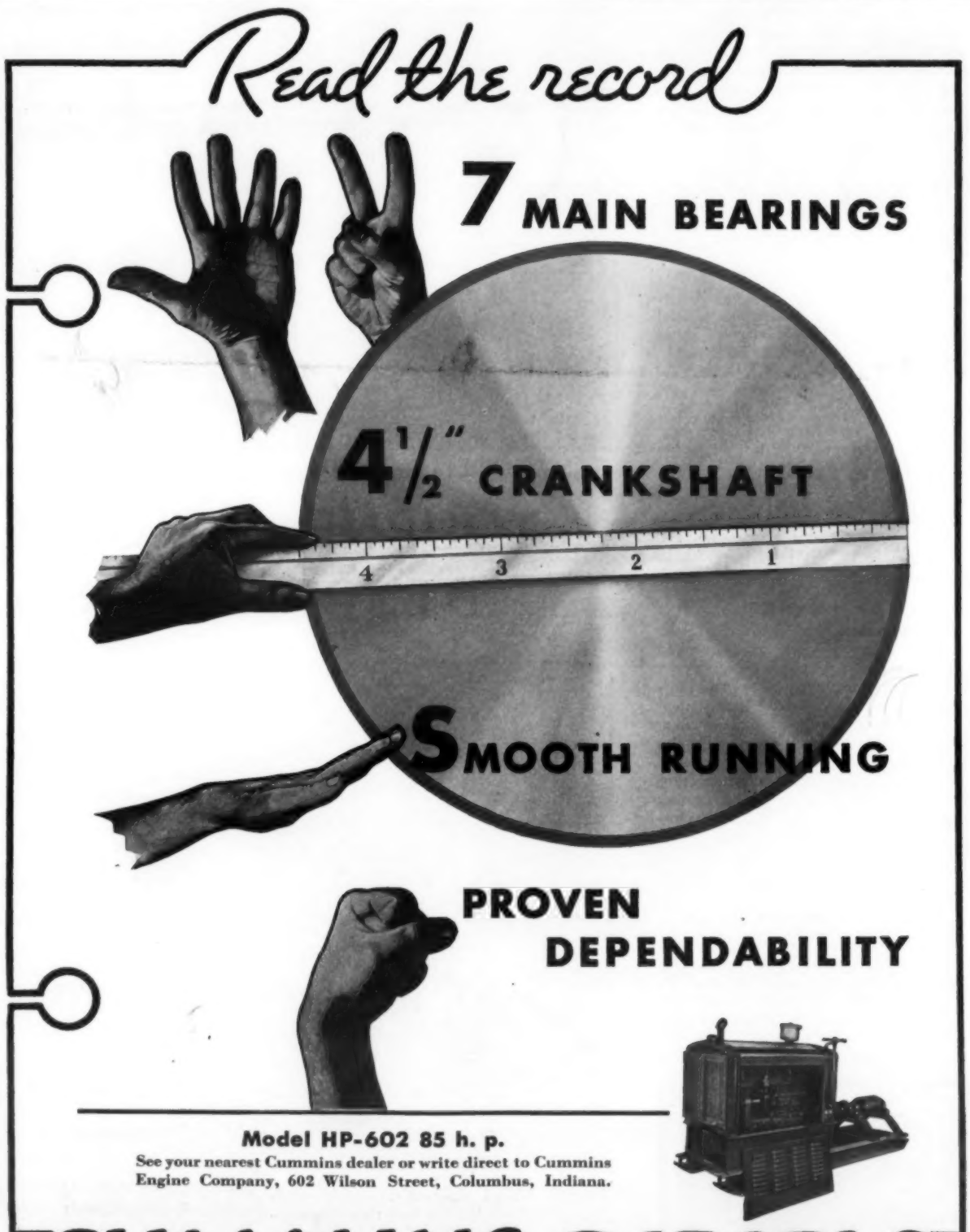
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Snow Removal Problems on No. Dak. Prairies

Snow Fences and Ridges Prevent Drifts While Rotaries and Truck Plows Clear State Highways

By RAY ROBINSON,
Traffic Engineer, North Dakota Department of State Highways

(Photo on Page 44)

Snow removal in North Dakota presents one of the most difficult problems the Highway Department has to contend with. Due to the fact that the greater part of North Dakota is treeless prairie and the wind blows almost continuously, the snow drifts a great deal of the time. The high velocity of the wind and the low temperature, at times, cause snow drifts to pack very hard.

Snow Control

Weeds, brush and other obstructions on the right-of-way which might cause the snow to drift are removed in the fall. Snow fences are then erected along the highways where the grade lines are low and along deep cuts. The fence is erected a distance of 60 to 100 feet from the top of the back slopes, most of it on the north and west sides of the highways as the prevailing winds are from the northwest. The North Dakota Department of State Highways has erected over 550 miles of snow fence.

In addition to this many miles of highway are protected by snow ridges or windrows. These are constructed parallel to the highway with the first ridge about 60 feet from the top of the back slope. Another ridge is then made approximately 15 feet back of and parallel to the first ridge. Three such ridges will stop a large volume of snow and are almost as effective as snow fence until the spaces between them are drifted full; more ridges can then be made. Early in the season when the snow fall is light, these ridges or windrows are made with motor patrols. When the snow fall is too heavy for motor patrols, V-type push plows and four-wheel-drive trucks are used.

Snow Removal

The general practice followed for the removal of snow from the highways is to open the highways wide enough for traffic to get through, with V-type push plows and four-wheel-drive trucks, then follow with rotary-type plows and widen the full width of the roadway. Due to the very hard drifts, the 7 to 10-ton four-wheel-drive trucks with very substantially-built V-type push plows do the most satisfactory work. Rotary Snogos are used for widening. In many cases it has become necessary to rebuild and reinforce snow removal equipment to withstand the heavy snow removal work.

The world's registration of motor vehicles is, according to *Facts and Figures* of the Automobile Manufacturers Association, 36,500,000. Of this, 22,450,000 cars and 3,550,000 trucks are registered in the U. S.

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Johns-Manville Asbestos Frictions
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Improved Screw Thrust with Positive Clutch Release
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STERLING MACHINERY CORP.
411 Southwest Blvd., Kansas City, Mo.

Motor Truck, Fitted with Power Take-off, Provides Power for an Arc Welding Generator as Well as Transportation

Truck with Power Take-Off Drives Welding Generator

Welding and pipe line contractors, and others interested in the use of welding for repairs and maintenance of their equipment can install an arc welding generator on any standard 1½-ton truck and drive the welder direct from the truck motor by means of a power take-off developed by the Hercules Steel Products Co., Galion, Ohio, in conjunction with the Lincoln Electric Co., Cleveland, Ohio.

This power take-off, which makes the truck a power plant as well as a means of transportation, is made in various models to operate as a direct drive or from the side and is adaptable to all makes and models of trucks. It does not affect the road speed or power of the truck.

Power supplied by any standard make of 1½-ton truck is sufficient to drive either a 200 or 300-ampere welding generator. The power take-off can be controlled from the driver's seat by a single lever. While welding, the speed of the truck motor is controlled by a fly-ball type of mechanical governor. All bearings in the unit are of the anti-friction ball and roller type. The unit is guaranteed to transmit 120 brake hp at 2,800 rpm, 200 foot-pounds torque.

An analysis of the type of transportation used for road and public utilities construction material involving 379 loads in a 1934 highway transportation survey in California shows that 77.8 per cent of the loads were moved by owner-operated motor trucks, 19.3 per cent by contract carriers using motor trucks and 2.9 per cent by common carriers.

Sub-zero January weather, but this LE TOURNEAU 12-Yard, one of three, worked the clock around for John F. Bloomer.

LE TOURNEAU MOVES THE EARTH . . . DESPITE ZERO WEATHER

Loomis' 8-Yard delivers 41 cubic yards hourly through 600 icy hours on this highway job overlooking Lake Superior.

Neither contractors John F. Bloomer nor Claude M. Loomis believe in letting the earth freeze under their feet. They move it too fast for that.

Up near Iron River, Wisconsin, Bloomer has worked three 12-Yard LE TOURNEAU Carryalls steadily 24 hours a day through the zero weather and snows of January and February, making earthmoving profits at a time when most equipment lay idle.

Loomis, too, moved the earth with LE TOURNEAU equipment during this fierce winter. His 8-Yard Carryall excavated 25,000 yards in 600 working hours during January on a one-way haul that averaged close to 1,000 feet. He has since ordered a 12-Yard Carryall.

Hundreds of successful contractors the country over, like Bloomer and Loomis, keep the earth moving the year around with LE TOURNEAU equipment. Ask your tractor dealer to show you LE TOURNEAU equipment at work—talk to our users.

R. G. LE TOURNEAU, INC.

PEORIA, ILLINOIS STOCKTON, CALIFORNIA

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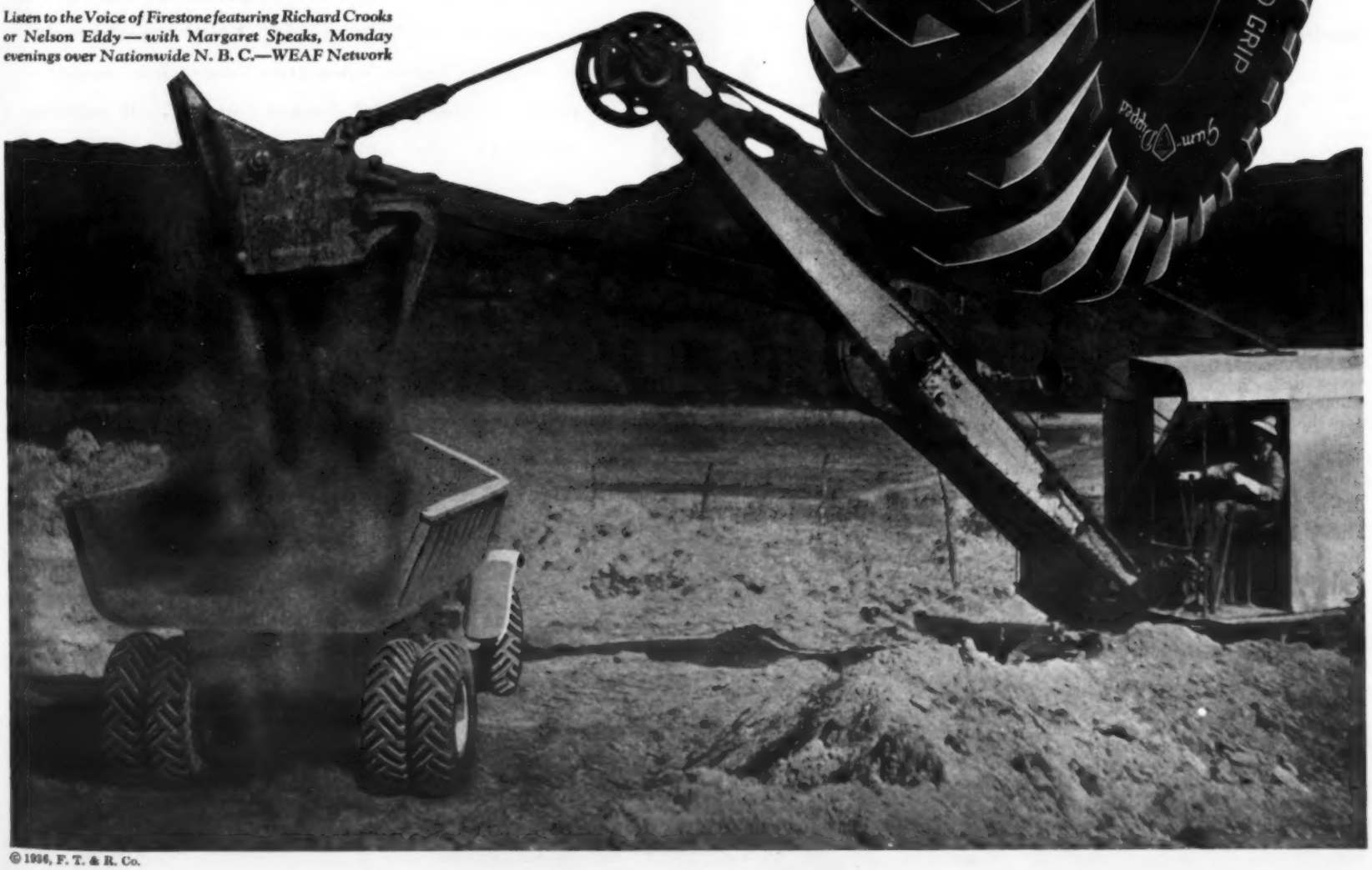
Firestone
GROUND GRIP TIRES
—Greatest Traction FOR ALL CONSTRUCTION JOBS!

● Firestone Ground Grip Tires haul heavy loads through the toughest going! These massive tires, with the patented super-traction tread, pull right through sand, mud, loose gravel, snow—without chains. They speed up work—cut operating cost.

To gain tremendous strength to withstand such heavy construction work these tires are built with patented Gum-Dipped High Stretch Cords—and two extra layers of these cords lock the tread permanently to the body of the tire.

Save time, money, trouble—equip with Firestone Gum-Dipped Tires. The nearby Firestone Auto Supply and Service Store or Firestone Tire Dealer is ready to serve you.

Listen to the Voice of Firestone featuring Richard Crooks or Nelson Eddy—with Margaret Speaks, Monday evenings over Nationwide N. B. C.—WEAF Network



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Rebuilding County Road with Plant-Mix

(Continued from page 1)

asphalt from the drum furnished the proper amount for the base.

When the batches were delivered to the mixer and before the asphalt was added, from 2 to 3 quarts of gasoline was added to the base batches or 4 to 5 quarts for top batches, to prime and clean the stone and permit the asphalt to cling to it.

Hauling and Placing the Mix

Two batches made a truck load and from four to seven trucks were used hauling base, and three to five for top. The trucks were metal lined with dump bodies and were all hired. In summer, base was laid in the morning and then top in the afternoon on the previous day's run of base. The Jaeger screw spreader laid an average of 3,000 feet of base per 10-hour day and its best record on top was 2,900 feet in four hours.

The trucks backed up to the receiving hopper of the spreader and tipped the bodies, then the spreader pushed them ahead and the twin screws spread the material uniformly across the base. The asphalt-mix base was laid 3 inches thick and compacted with a 10-ton Buffalo-Springfield steam roller to the required 2¼ inches. The screed on the spreader set the crown for both base and top.

Top was spread 1¼ inches thick and rolled to 1 inch with a 5-ton Austin Pup roller followed by an 8-ton Buffalo-Springfield tandem. The base and top courses were constantly checked with a 16-foot straight-edge to insure smoothness.

Personnel

This contract was completed by Brown & Root, Inc., of Houston, Texas, with James Dellinger as Superintendent. The work was a county project under the direction of C. R. Haile, County Engineer of Harris County, with T. D. Heaney as Project Engineer for the county.

Handbook of Soviet Union

A 562-page book containing very complete information on the Soviet Union has recently been issued as a successor to the "Economic Handbook of the Soviet Union" published by the American-Russian Chamber of Commerce in 1931. This "Handbook of the Soviet Union" presents in a concise form facts and statistics concerning the development of some of the phases of national economy of the U.S.S.R.

One of the eighteen chapters of the book is devoted to the subject of transportation and communications, including information on the roads of the U.S.S.R. Another deals with American-Soviet trade relations, including the matter of exporting to and importing from the U.S.S.R.

Copies of this Handbook may be secured from the American-Russian Chamber of Commerce, 261 Fifth Avenue, New York City. Price: $3.00.

The Use of Cotton for Roads May Be Encouraged by Govt.

A plan under which the government expects to spend $1,300,000 to encourage the use of cotton for road building awaits only the final approval of Secretary of Agriculture Wallace. If the plan is approved, the Department will purchase the fabric and mats and turn it over to states which wish to cooperate in this experimental road building.

A booklet describing the purpose and performance of cotton fabric in building low-cost roads may be secured from the Cotton-Textile Institute, Inc., 320 Broadway, New York City.

New 2-Yard Shovel Shown at Road Show

The Harnischfeger Corp., 4419 W. National Ave., Milwaukee, Wis., exhibited at the Road Show an entirely new excavator, Model 765, which embodies new engineering ideas to speed up the digging cycle and increase production.

This 2-cubic yard unit is one of the new series of P & H 700 machines, a line which has been redesigned to take advantage of recent developments in alloy steels and arc-welded construction for greater strength with less weight.

The line includes several P & H features which suit them for the adoption of diesel power. The heavier construction of the P & H swing and crowd mechanisms have the additional strength and weight to carry the greater sustained power which the diesel engine provides. It not only permits faster continuous digging speeds, says the manufacturer, but also ample power carry-over to prevent motor stalling when the going is hardest.

Although the 765 is also available with gas, this model is powered by an 8-cylinder 4-cycle Fairbanks-Morse diesel engine rated at 165 hp at 1,200 rpm for burning the cheaper grades of fuel oil.

New Self-Cleaning Ripper

The Killefer Manufacturing Corp., Ltd., 5525 Downey Road, Los Angeles, Calif., exhibited at the Road Show its new, complete-revolving road ripper.

The tool-head with its five standards revolves like a barrel, forward or back. Obstructions stay where they are for as the standards rotate, they pass between the heavy frame members. Bolted-in standards are mounted on a heavy shaft which rotates on four lathe-turned bearings in four heavy parallel frame members. This shaft actually forms a strong rear cross-member. The wheels are drum-type, Timken-equipped, flush both sides and protected under and inside the frame. The heavy frame is smooth on top, riveted and welded. A long hitch permits short turns without fouling.

When the trip is released, the forward pull of the tractor, without stopping or backing, revolves the tool head until the points are above the frame. The points roll to the digging position again at the next pull of the trip rope.

Partridge Advanced by Timken

The Timken Roller Bearing Co., of Canton, Ohio, has announced the appointment of S. C. Partridge as Assistant General Manager of the Industrial Division, with headquarters in Canton. Mr. Partridge has been associated with the Timken organization since 1925, having served in a number of positions, including Assistant to the General Sales Manager of the Automotive Division in Detroit, from which position he was transferred to his present position in Canton.

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. . . at Lower Cost—Because of These Advanced Features
Valve-in-Head Engine offers lower fuel consumption—greater accessibility.
Cooler Air . . . a cooling system of advanced design, perfected by the builder of Le Roi Engines, eliminates overheating.
Spring mounting . . . standard with Le Roi, reduces vibration and assures lower maintenance costs and increased life of the machine.
Engine and Compressor built entirely in the Le Roi Plant . . . means centralized responsibility of manufacture.
Buy the only Air Compressor made by an engine builder. The precision equipment, necessary to the building of Le Roi Engines, is used in the construction of Le Roi Air Compressors. Better air compressors are the result with the natural advantage of lower operating costs, less maintenance expense, and longer life . . . all making for lower "air" cost to you. Le Roi Air Compressors are available in all mountings, single or two stage, portable or stationary. The catalog gives complete information; write for your copy.
Le Roi Company Milwaukee, Wis.
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AIR COMPRESSORS
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Builders of LE ROI ENGINES AND GENERATOR SETS

Rock from Tunnel Used in Fill for Earth Dam

(Photo on page 44)

R. Giavina, Contractor for Clendening Dam, Used Crawler Wagons and Large Truck Fleet

THE Clendening Dam of the Muskingum Conservancy Project is located approximately 5 miles from Tippecanoe, Ohio, and near Cadiz, Ohio, which is at the eastern edge of the great Muskingum watershed. It is on Bushy Fork which flows into the Tuscarawas River, a tributary of the Muskingum River. This project consists of an earth dam 1,050 feet in length and 62 feet high on an impervious foundation with a saddle type spillway and the outlet for the impounded waters through a tunnel controlled by three 3½x7-foot gates. The drainage area above the dam is only 70 square miles but the conservancy storage will be 27,900 acre-feet and the flood control storage 26,100 acre-feet.

The contract for the construction of Clendening Dam and tunnel was awarded to R. Giavina of Charleston, W. Va., on February 5, 1935 for $292,335.00. The work includes 70,000 cubic yards of common excavation, 98,600 cubic yards of rock excavation, and 1,900 cubic yards of rock tunnel excavation. The embankment of the dam requires 331,000 cubic yards of suitable material, and the tunnel lining and spillway structure 5,300 cubic yards of concrete. The embankment is being laid up in 6-inch loose layers of earth compacted by sheepsfoot rollers and wet to give the proper compaction under rolling. The slopes for the faces of the dam are 1 on 2 to 1 on 4 upstream and the same downstream.

Tunnel Driving

The tunnel of the Clendening Project is 480 feet in length and is horseshoe shape 10 feet high. It is to be lined with concrete 1 foot thick all around. For driving this tunnel the contractor had a 315-foot Schramm compressor at the west portal and a 120-foot machine of the same make at the east portal. A Lorain 75 shovel at either end proved adequate for the handling of the material but in the early stages of excavation when the work was in open cut there was not sufficient hauling equipment to make the operation of the shovels economical as they were shut down for lack of trucks for more than half the time.

At the east end of the tunnel there were three Gardner-Denver jack hammers and at the west end a single Cleveland wagon drill. Other pneumatic equipment included two Gardner-Denver pavement breakers used on the key wall trench for the dam. In the tunnel the contractor used four Ingersoll-Rand drifters. The holes were shot with 60 per cent Atlas dynamite.

Embankment

Some of the excavation from the tunnel went into the construction of the embankment, part into rock fill for the toe trench and part into a cofferdam across Bushy Fork to divert that stream through the tunnel during the latter part of the construction of the embankment. The major portion of the embankment was taken from downstream borrow pits which were first stripped with the Caterpillar power-operated elevating grader with 48-inch belt. The pits being open, the Caterpillar Seventy-Five diesel pulled the machine back and forth to load the fleet of hauling equipment. This fleet consisted of four Euclid Trac-Truks on demonstration, six Athey 11 and 14-yard crawler wagons hauled by Caterpillar Sixty, Sixty-Five and Seventy tractors, a single 5-ton International truck owned by the contractor and a fleet of twenty hired trucks.

The earth deposited by the hauling units was spread uniformly into the specified layers by a Caterpillar Fifty with an Athey bulldozer and a Caterpillar Thirty with a LaPlant-Choate bulldozer. The loose material was compacted with a Blaw-Knox Ateco sheepsfoot roller.

The contractor worked the labor organization in three 5-hour shifts and employed a total of 250 men in the three shifts.

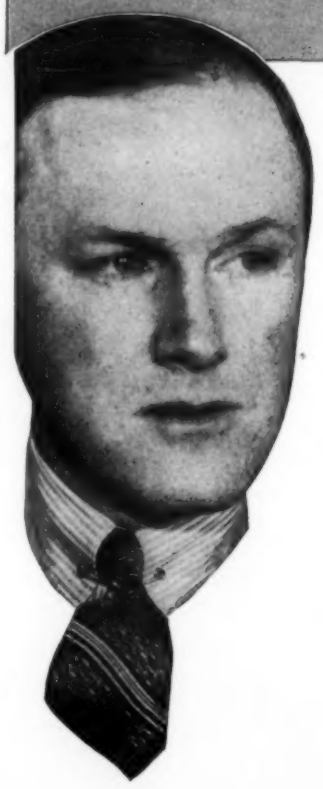
Personnel

The Muskingum Conservancy Project is in charge of Major J. D. Arthur, Jr., Corps of Engineers, U.S.A., as District Engineer with Theodore T. Knappen as Chief of the Engineering Division. The Clendening Dam is in the Dennison Area, S. M. Baily, Area Engineer, and C. S. Joslyn, Resident Engineer. The contractor, R. Giavina, was constantly on the job to direct the work. D. Grimes was Superintendent.

C. & E. M. Photo

Looking Along the Center Line of Clendening Dam During the Early Stage of Construction

It Paid *to forget the old stuff!*



One contractor saved one-half bag cement per yard by replacing tunnel lining equipment with the Rex Pumpcrete.

Another added nine pounds cement per yard above specifications and cut all his original estimates of cost by using the Rex Pumpcrete.

The Pumpcrete was brand new to both companies, but once they met it—they forgot the *old stuff.*

Equipment that is already owned, methods of the years before, are often the worst drawbacks in getting low costs on the job.

In 1936, before you buy, before you bid, investigate the Up-to-Date Methods of Handling Concrete.

CHAIN BELT COMPANY
1666 West Bruce Street Milwaukee, Wisconsin

ASK US WHICH?

The Up to Date Methods of Handling Concrete

REX CHAIN BELT COMPANY
Construction Equipment

BUILDING CONTRACTORS ARE TURNING COSTS INTO PROFITS

Owners Report Big Reductions in Hauling Costs with

FORD V-8 TRUCKS

Hundreds of builders have found out that profits do not depend entirely on increased income. To a large extent, they depend on reduced costs. Conclusive evidence comes from those builders who operate Ford V-8 Trucks.

The cost records of owners PROVE V-8 ECONOMY. These records show over-all economy as well as savings in fuel and oil costs. Interest and depreciation charges are low because of low first cost. Maintenance expense is low because of V-8 Reliability and because of Ford's low-cost engine and parts exchange privileges. Insurance, taxes and wages are less because V-8 Performance permits doing jobs that formerly required larger trucks or more units.

PROVED BY THE PAST . . . Ford V-8 Trucks have been IMPROVED FOR THE FUTURE. You can expect even greater economy . . . even more sensational performance . . . even more impressive reliability. And your expectations will be fulfilled! Call your Ford dealer today and set a date for an "on-the-job" test with your own loads, over your own roads, with your own driver.

Ask about the Ford Engine Exchange Plan and other parts exchange privileges which assure low maintenance costs.

Stage Construction on Secondary Roads

Minimum Cost to Grade and Drain is $1,800 a Mile —Eventual Traffic Will Determine Final Surface

By T. H. CUTLER,
Chief Engineer, Missouri State Highway Department

IN every state there are certain trunk line highways on which the traffic is such that every year they earn more than the annual charges against their original cost and maintenance and amortization. These roads are "Earners." If highway construction and maintenance charges are to be met by the users thereof, it is these "Earners" that must foot the bill. Naturally, therefore, they should constantly receive special attention, supermaintenance and betterment in order to attract and hold travel so that surpluses will be available to care for the large mileage of borderline or non-earners, whose justification for existence is based more on comfort, convenience, recreational and similar social uses.

A Million Miles Awaiting Attention

There is an insistent demand for improvement in the hundreds of thousands of miles of roads with medium traffic but large social value. It is obviously difficult to put a dollar and cents value on the social contact, educational or recreational features of a non-earner road although we do know it is there.

There is a genuine sentiment all over the United States for the improvement of the mileage of highways on the rural free delivery system with an all-year dependable surface. The report of their status as of June 30, 1935, shows 1,354,820 miles in this system of which 453,047 miles are of earth with no surfacing at all.

A little consideration of the present day highway problem will convince one of the impossibility of building an immense mileage of roads of a high-type surface. What we highway engineers are looking for now is a low cost, all-weather, dependable surface, which will give a service approaching that of the higher cost types without excessive maintenance.

Costs

In any adequate worthwhile road construction there is a certain irreducible cost of grading and drainage construction in even the most favorable locations. An analysis of costs in every county in Missouri shows this figure to be approximately $800 per mile.

There is no doubt that there are some sections in most states where a farm-to-market road could be graded, drained and surfaced for $2,000 a mile, but conditions would have to be ideal, cheap surfacing available within a short haul, with little grading and drainage requirements; also with such a small amount of traffic to make a dustless surface unnecessary.

Traffic and Money Set Standards

The traffic to be served by any road with due consideration to funds available is the primary factor in determining the standard to which it should be constructed. Consideration should, of course, also be given to possible future traffic. Some roads carrying a moderate amount of traffic will probably not carry much more for many years to come, whereas some roads with the same present density of traffic will eventually have to carry a much greater traffic, requiring a higher-type surface.

For all this type of road a base stabilization with dustless surface which can be used as the initial surfacing on a stage construction basis will probably be a wise and economical beginning for the more important roads of this enormous mileage of our road system.

A number of states have recently given their attention to this problem of how best to meet this need for relative low cost surfacing, particularly in North Carolina, Nebraska and Missouri.

In the past seven years automobile registration has increased 40 per cent while the amount of road building has only increased 15 per cent. This coupled with the fact that the average car travels twice what it did seven years ago gives us some idea of the task ahead in road construction to give proper service.

From a paper presented at the Thirty-Third Annual Convention of the American Road Builders' Association.

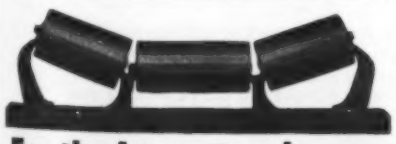
Portable Electric Signals Control Road Job Traffic

On perhaps half of the highway contracts, one side of the roadway is left open for one-way traffic which moves back and forth past the work. Usually two flagmen, one at each end of the job, handle this traffic. If this goes on for 24 hours a day, it runs into considerable money.

Signal Service Corp., Elizabeth, N.J., has developed portable stop-and-go signals mounted on tripods which can be used in conjunction with a manually-operated switch to control traffic by placing one at each end of a job. Power is supplied by a small gasoline motor-driven 110-volt direct current generator with weatherproof, flexible, interconnecting cable. This equipment has the advantage of permitting one man rather than two, to do a better job, of handling traffic past the work.

New Novo Representative for Southwest District

The Novo Engine Co., Lansing, Mich., has announced that G. W. Stevens, Sales Engineer, will serve as factory representative for that company in the south and southwest territory. Mr. Stevens will make his headquarters at 3441 Westminster Street, Dallas, Texas, and will contact all Novo distributors in that section, bringing to both distributors and contractors the benefit of his knowledge and experience in the line of contractors' equipment.



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MARCH						
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15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	BUY "AMERICAN"			

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New Variable-Weight Tandem Roller

The Galion variable-weight tandem roller, recently announced by the Galion Iron Works & Mfg. Co., Galion, Ohio, offers in one compact unit the equivalent of a series of tandem rollers from 7 to 10 tons in weight.

The frame of this unit is made from heavy structural channel and heavy boiler plate, all welded with ample cross bracing. It is claimed that the frame will not spring or twist, and it gives full protection to the compression roll and power plant which are fully enclosed and protected from the weather. The engine compartment is equipped with large ventilated doors of ample size for convenience when making engine adjustments. A towing connection is welded to the front cross member. The enclosure of the compression roll follows the curve of the roll to the top, then follows back in an unbroken line enclosing the water and fuel tanks and forms the cowl, which meets the sloping dash smoothly, not only giving the unit a neat appearance but providing the operator with clear vision of the roadway ahead of the machine.

The rolls are water-tight welded construction of heavy steel plate welded on a special fixture and accurately machined. They turn on stationary axles and are mounted on Timken taper roller adjustable bearings. Both steering and compression rolls are equipped with double scrapers the full width of the rolls. The rolls are fitted with brass plugs for filling the rolls with water when additional weight is added, the feature of this new unit.

Power is furnished by a 6-cylinder engine, developing 48.5 hp at 1,500 rpm, which is equipped with air cleaner and oil filter. A side hand cranking device is installed for starting, or electric starting may be specified. The fuel tank capacity is 28 gallons, and the sprinkler tank capacity 90 gallons. A water pump driven from the engine is supplied for filling the rolls and sprinkler tank when water pressure is not available. The capacity of the pump is sufficient to fill the rolls and sprinkler tank in approximately 20 minutes.

Complete specifications for this new roller are included in Bulletin 195 which interested contractors and highway engineers may secure direct from the manufacturer by mentioning this magazine.

Fireproof Covers for New Heating Kettles

The White Mfg. Co., Elkhart, Ind., reports that fire hazards in the use of tar and asphalt heating kettles for pavement repair work have been brought to a minimum in its new kettles which are built with fireproof tops. These kettles have been developed particularly for repair work where cut-back asphalt and other inflammable bitumens are used. Instead of hinged hatchways which tend to warp, permitting spillage and also the entrance of rain water, the new White kettles are equipped with 16-inch

The New White Fire-Proof Heating Kettle

diameter manhole covers and a simple clamping device.

In order to release gas and as an exit for foaming material, the kettles are equipped with an automatic overflow or pressure release at the rear, farthest from the burners. The kettles are mounted on either solid or pneumatic tires with roller bearings and semi-elliptic springs. Current practice is general in equipping kettles with either hand spray pumps or motor-driven spraying outfits, with flexible steel or rubber steam hose, and spray bars. All kettles have a stack exhaust.

The new White kettles are being offered in 1, 2, 3, 4 and 6-barrel sizes. The 1 and 2-barrel capacity kettles are equipped with one oil burner and all other sizes have two burners. The burners and fuel tanks are detachable and can be used for many other purposes in thawing, heating and burning, such as for thawing frozen hydrants, burning weeds, etc.

New York Removes Snow from 11,500 Miles of Road

Through the efforts of thousands of workers, aided by 1,182 motor trucks, 209 tractors, 1,129 displacement and 19 rotary plows, 11,114 miles of New York state highways were freed from snow in the winter of 1934-35. Because of the extreme temperatures which have been registered during the present winter and particularly since the first of 1936, and the increase to 11,541 miles of road under care, it is expected that the total of 1934-35, set at $1,371,000, will swing upward by more than $125,000 in 1936, according to a report by Bert Pierce, Automobile Editor, *New York Sun*. These figures do not include local expenditures by communities.

The Apex Construction Co. recently received a contract from the Continental Oil Co. for welding by the Oxyacetylene method 45 miles of 8-inch pipe line from Lake Charles to Basile, La., in conjunction with a 6-inch line.

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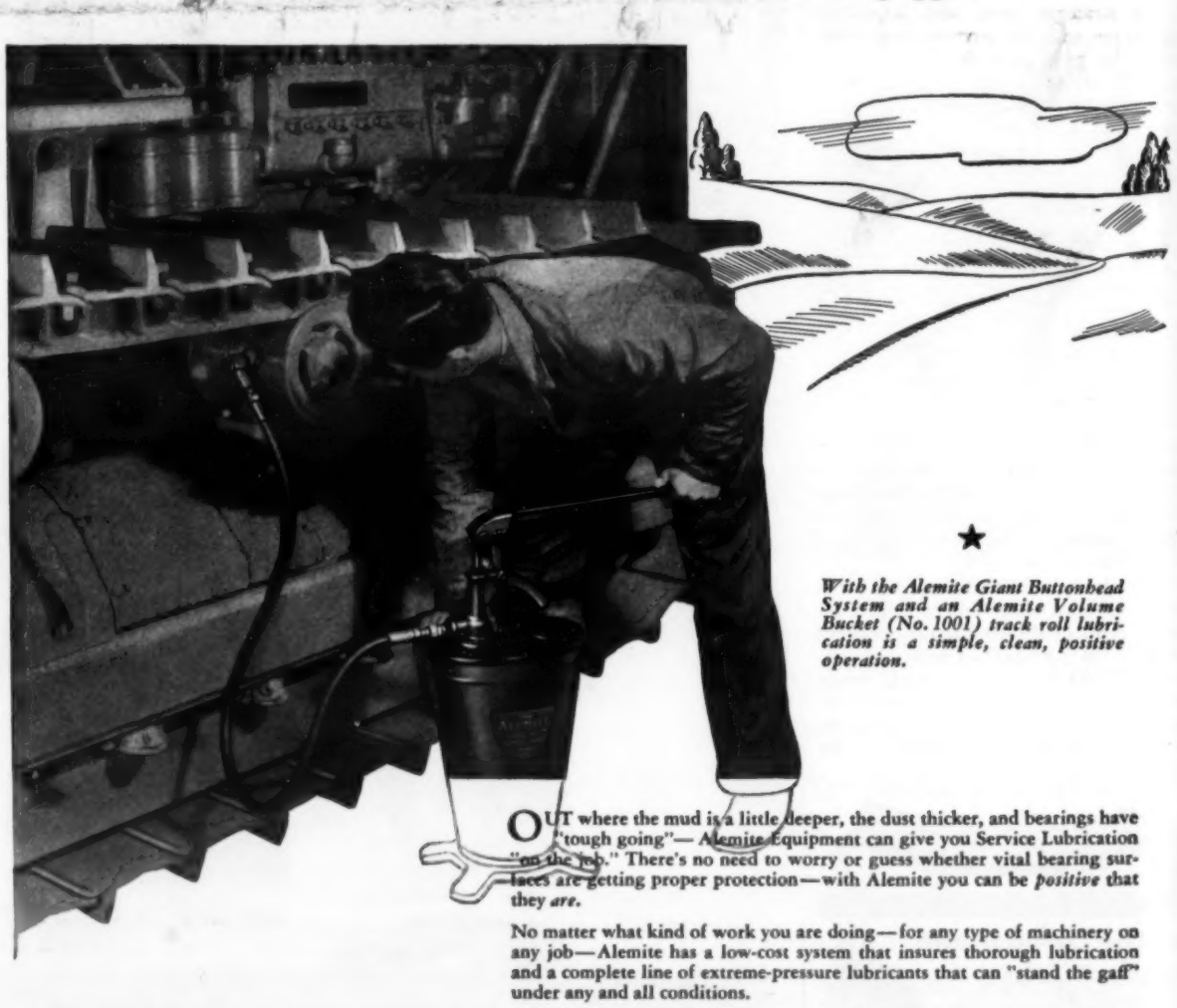

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Europe's Road Problem Mainly Maintenance

(Photo on page 44)

MANY of the European highway systems have been established for hundreds of years. Hence, in comparison with younger and less highly developed countries in other parts of the world, its highway work is more in the nature of reconstruction and maintenance. For 1934, Europe reported a total of 3,386,330 miles of roads, which showed an increase over the previous year of 21,673 miles. This should not be construed to mean that these countries are not making progress with their highway improvement plans, but rather that much of their work was not reflected in the actual mileage increases.

Lack of funds, owing to the adverse economic conditions, has for the past few years retarded road construction to a marked degree in many of the countries of eastern Europe, notably Poland, Hungary, Bulgaria, Greece, Yugoslavia, Latvia and Lithuania. On the other hand, most of the western countries, including England, France, Germany, Italy, Belgium, Netherlands, Denmark, Norway, Sweden and Switzerland, are either continuing their regular programs or are improving their roads as a measure of unemployment relief.

Most of New Work in Germany

Germany is the outstanding European example of a greatly expanded highway construction program by the National Government on a network of super-highways which will connect all the principal centers of industry with all the strategic ports and important connections with the surrounding countries. The plan provides for approximately 3,000 miles of main highways, plans for the development and construction of which are being carried out by the government railway authorities. The Railway Administration has set up a subsidiary, the Reich Motor Road Society, for the construction and administration of the undertaking which, when completed, will give Germany the finest super-highway system in the world.

The new roads are of the dual pavement type with parkways between pavements. The most modern machinery is being used and the roads are surfaced with the highest type of concrete and macadam surfaces. During the latter part of 1935 it is estimated that 113,000 men were employed on construction work and another 150,000 men were indirectly employed in supplying the various materials and equipment used on the road.

While the Government has stated that the project is to relieve unemployment and to provide the country with the most modern and coordinated system of transportation in Europe, which would speed up economic recovery, observers recently returned from Germany have learned from various sources that the primary purpose of this gigantic road program is to provide the speediest and most efficient transportation system for machines and men in case of war.

Italy Too Has Built New Roads

In 1922 Italy's roads were about the worst in Europe but a vast road-building program has been undertaken under the Fascist regime and today the roads of Italy are perhaps the finest in Europe. Up to June 30, 1934, the government had spent 1,237,229,000 lire (the lire is worth about 5 cents) on its 12,400 miles of state roads. In addition to government allotments, funds were provided by automobile circulation taxes and other sources. On June 30, 1935, Italy's state system totaled 12,862 miles, of which over 6,000 miles were surfaced with bituminous permanent types of improvement and another 6,000 miles were of water-bound macadam.

Germany, Italy, U.S.S.R. Have Road Programs, Countries of East Europe Retarded by Lack of Funds

The balance of the total 105,000 miles of roads, 29,000 of which were provincial roads and 69,000 miles municipal, are maintained by the provinces and municipalities. In addition, there are the now famous Autostrade toll roads, some of which are owned by the state and others by private companies.

Photo by Prof. J. S. Crandell

Italy's Route 1, Between Imperia and Savona Along the Italian Riviera, Is an Example of Her Modern Roads

These nine projects are not connected and total only 314 miles and, while providing rapid transportation for the places they connect, have no material effect on the transportation system of Italy except as they provide speedways for tourists.

In addition to the expenditure for state highways, during the fiscal years of 1934-35 about 138,000,000 lire was provided for provincial and municipal roads. All construction and major repair work is carried out by private con-

(Continued on page 26)

On the Leesville Dam in Ohio, this "Caterpillar" Diesel Tractor works with a bulldozer, helping to move 700,000 cubic yards of material.
FIRST FOR THE SCHEDULES!
FIRST ON THE JOB!

When it comes to working out bids and schedules, you'll find that tractor costs are more and more being figured on the basis of what the "Caterpillar" Diesel Tractor can do—its low-cost operation and dependability make possible winning bids with an honest profit margin. When it comes to meeting the schedule and keeping the job moving smoothly, it's the "Caterpillar" Diesel again—hanging up records for low cost per hour, more working hours per day, more work per hour. It is FIRST on every count—get the details from your dealer. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

HERE ARE FACTS ON THE SHOW-DOWN

A Texas owner reports: "My 'Caterpillar' Diesel Tractor does the same work as my old gasoline tractor, but my fuel cost is now $1.20 per day, where it used to be about $7.70."

On the Mississippi Levee, a contractor reports that his "Caterpillar" Diesel has been hauling big loads from a drag-line at a fuel cost of only 15c per hour.

CATERPILLAR DIESEL

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Texas' New Bridge To Be One of Highest in World

Steel Cantilever Bridge Over Neches River Near Port Arthur To Cost $2,500,000 and Employ 450 Men for Two Years

By J. C. WATKINS and SIDNEY S. SMITH

(Photo on page 44)

WHILE Texas this year celebrates the 100th anniversary of its independence from Mexico, the state observes also the inception of a new era of progress, typified by the construction of the $2,500,000 Neches River bridge, one of the highest highway bridges in the world. This structure will rise from the flat marshland to provide a vertical clearance of 176 feet above the water level, and will have a horizontal clearance of 600 feet between the two main piers.

The San Francisco, Oakland Bridge will have a clearance, over navigable water, of 218 feet, 42 feet more than the Texas structure. The Neches River bridge will be 40 feet higher than the recently-dedicated Huey P. Long Bridge across the Mississippi, with its vertical clearance of 135 feet, and it will outreach the 155-foot clearance of the George Washington Bridge across the Hudson.

Construction of the bridge, the culmination of eight years of negotiations, is being financed jointly by a PWA grant of $1,141,000, a Jefferson County bond issue of $700,000, and state funds totaling $659,000. Two years and the services of between 300 and 600 men will be required to complete the project.

Actual work was started in February, following the receipt of PWA approval of contracts for the substructure, awarded to Union Bridge & Construction Co. of Kansas City, Mo., on its bid of $840,000.

The structure will be situated on a revised location of Highway 87 about 2 miles above the mouth of the Neches River and 6 miles northeast of Port Arthur, Texas. The highway will provide a direct connection from Port Arthur to Orange, Texas, thence eastward to New Orleans and westward to Houston, shortening the travel distance between those two cities. It thus becomes a part of the "Hug-The-Coast" highway paralleling the Gulf coast.

The Neches River at this site is about 1,000 feet wide with a main dredged channel 400 feet wide and 35 feet deep for ocean-going vessels. The area on either side of the river is marshy and flat, with an elevation a couple of feet above high tide.

Type of Structure

The bridge will be a high level structure without any movable spans. The main span across the river provides for a horizontal channel clearance 600 feet wide with a vertical clearance of 176.9 feet above mean Gulf level. This clearance is provided by a cantilever span 680 feet long between pier centers with a suspended span 340 feet long. Elevation of the roadway at the center of the main span is 184 feet above the mean Gulf level, while the highest point of the structure will be 230 feet above the mean Gulf level.

Layout of the structure is exactly symmetrical about the center of the main channel span, and the roadway descends on a grade of 5 percent toward each end. Beyond each end of the main channel span is a 374-foot anchor span; two 300-foot deck truss spans; 1,280 linear feet of deck truss spans from 1,500 to 170 feet long; 900 linear feet of deck girder spans, and 381 linear feet of reinforced concrete deck viaduct. Total

(Continued on page 29)

Caterpillar Announces New Stationary Diesel Engines

Expanding the range of power in its diesel engine line, Caterpillar Tractor Co., Peoria, Ill., has announced three new models, the largest being of V-type 8-cylinder design to be produced solely as a stationary installation, this being the first time in its three years of industrial engine building that this company has manufactured a product exclusively for the stationary power user. Caterpillar now manufactures five sizes of diesel engines ranging from 44 to 160 maximum brake horsepower.

The new models are the D17000, V-type, 8-cylinder, 160 horsepower; the D6600, 3-cylinder, 60-horsepower; and the D4400, 4-cylinder, 44-horsepower. The D17000 is the outgrowth of a demand for increased power by users of larger engines. To fill these requirements an engine of V-type design was chosen and is said to be well suited for such service as shovels, industrial locomotives, compressors and crushers.

The D17000 delivers 35 more horsepower than the present largest model, the D13000. This added power extends the service of this engine. In construction it will power 2 and 2¼-yard shovels and draglines. As a source of electric current, it will be offered as a unit with an 80-kilowatt generator, an announcement of interest to the smaller cities who purchase diesel engines to power their municipal plants.

The D17000 is a true diesel engine with a 4-stroke cycle, valve-in-head, water-cooled, and features solid injection of fuel into pre-combustion chambers. The eight cylinders are in two groups of four, set at an angle of 60 degrees.

The D4400 industrial engine extends the other end of the Caterpillar line and is expected to find use in many fields where portable power is in demand. Considerably lighter in weight and having higher speeds than the four other diesels, it is adapted to powering ½ and ⅜-yard shovels, or a 20-kw generator.

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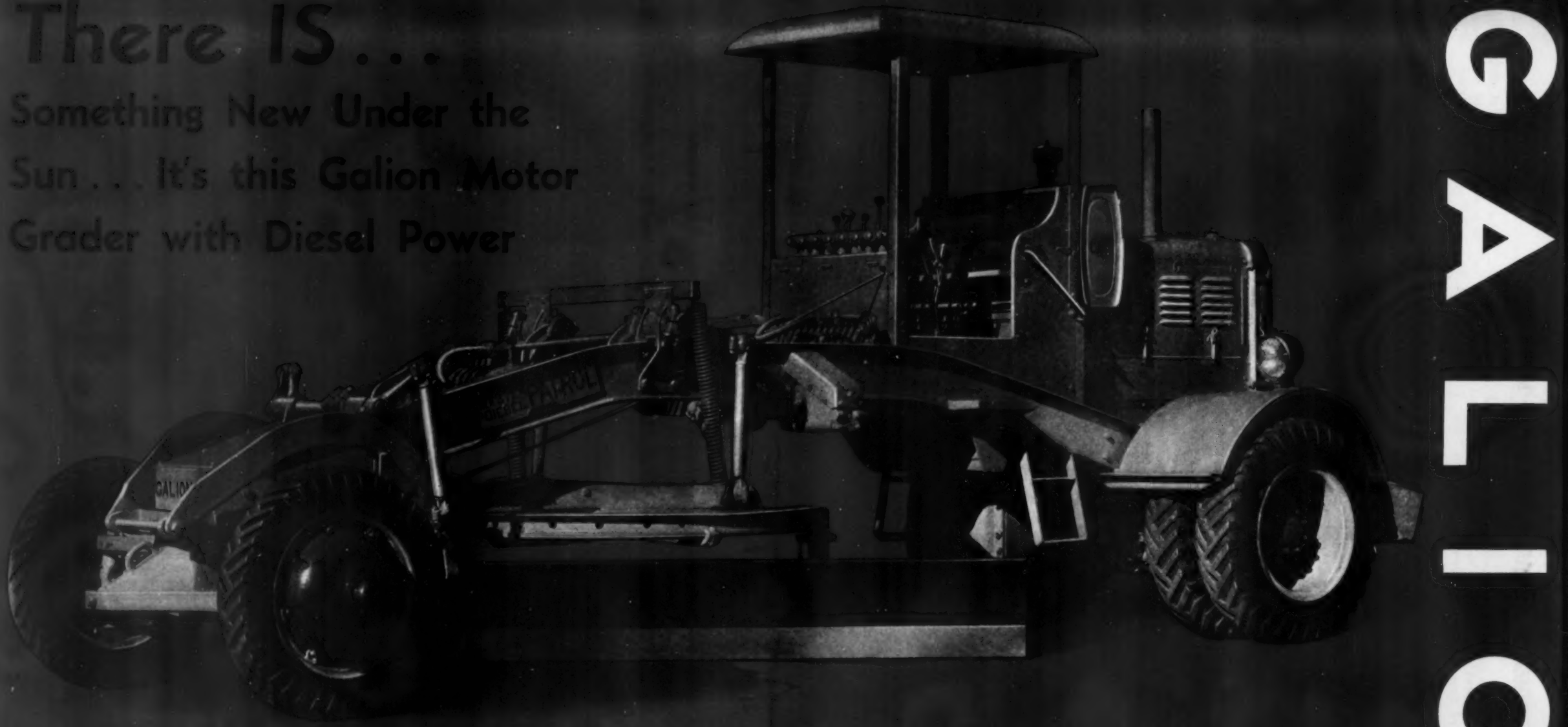

This big "Master Diesel" Motor Patrol Grader is Galion's outstanding contribution to the Road Building Industry for 1936.

Look again . . a close scrutiny of this big Grader and a careful study of its many features will readily show you why so many Contractors are turning to Galion for satisfactory and economical service in building and maintaining roads.

Long experience in designing and manufacturing road machinery of all kinds has enabled Galion to build into this Grader every feature essential to meet the heaviest duty that a motor grader may be called upon to perform.

This New Unit is powered by a McCormick-Deering Model T D-40 Diesel Engine with six forward and two reverse speeds. Leaning front wheels, electric starter and lights. Double drive with 4 or 8 tires in rear and enclosed cab, can be furnished if desired.

Men who know Graders will appreciate the care that Galion Engineers have used in designing this "Master Diesel". For years these Engineers have worked incessantly to make Galion Road Machinery better . . never satisfied just to "get by". Bulletin No. 196 completely covers this New Galion Diesel-powered Motor Grader. Send for a copy today.

Galion Road Machinery:

Oiled Road Roller with "Roll-A-Plane" Attachment—Bulletin No. 191

"Variable Weight" Tandem Roller—Bulletin No. 185

Portable Roller—Bulletin No. 184

"Junior Patrol" Motor Grader—Bulletin No. 181

Leaning Wheel Graders—Bulletin No. 182

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Lubrication Queries

Is some lubrication problem bothering you? Tell us about it and we shall be glad to help you.

Question

What is the "film strength" of a lubricant?

Answer

The term "film strength," which is interchangeable with oiliness, adhesion, greasiness and load-carrying power, denotes the resistance to rupture of any part of the films of lubricant covering the metal surfaces of a bearing. Under heavy or shock loads, if such bearing surfaces are damaged by direct metal-to-metal contact, the cause is said to be the poor "film strength" of the lubricant as designating its unsatisfactory load-carrying properties.

In discussing this topic, Bulletin No. 5, issued November 25, 1935, by the Industrial Lubrication Council, Inc., 61 E. 42nd St., New York City, states:

"When machinery is forced to maximum speed and made to carry greater loads than it is designed normally to handle, then the bearings overheat unduly, thinning the lubricant and reducing its power of adherence to the metal surfaces. In this weakened condition, extra shocks or foreign matter such as dirt or sludge will cause the films to break, allowing the opposing metal surfaces to strike, bringing on instantaneous higher local heats, which prevent the films at that point from immediately reforming. This is the critical point in all machine lubrication, for then if immediate conditions of lubricant, load, speed, cleanliness and cooling do not favor the situation, the phenomenon of bearing failure takes place. When a series of such failures are recorded against any type of mechanism and before the machine design is changed or new materials are developed for the damaged parts or a new system of oil application is considered, a demand is usually made for oils having a higher film strength—an oil of greater adhesiveness and load-carrying ability is required.

"As compared to all mineral oils of the same consistency, oils made from animals and vegetables, when new, have a greater degree of film strength, and this property increases as these oils become rancid through decomposition by age or through continuous re-use, when the fatty acid content increases to a point that will cause these oils to be unsatisfactory in all modern continuous circulating systems, as the fatty acids will then solidify and form sticky and non-lubricating films and substances. In their natural state the fatty acids which give this quality, referred to at times as 'greasiness,' can be removed from the original oils and then compounded with the mineral oils, resulting in an increase of their property of adhesion to metal somewhat in proportion to the amount of fatty acids used. Mineral oils as such all vary considerably in this property of adhesiveness or film strength. There is a definite technique established for artificially giving to the mineral lubricants various increasing degrees of load-sustaining properties. But this has not been reduced to a system of measurement of mechanical effect, nor has any agreement been reached regarding the proper name to be used describing this condition."

Dollars Per Mile of Road Expended in United States

On all state highway systems the total expenditure per mile, that is, the number of dollars spent divided by the number of miles in the systems each year, stood at $2,175 in 1925, rose to a peak of $3,020 in 1930, sank to $1,859 in 1933, and rose again because of a large increment of Federal grants to $2,565 in 1934. F. W. Lovejoy of the U. S. Bureau of Public Roads, in discussing highway revenues at the convention of the American Road Builders' Association, stated that if we assume a normal annual average expenditure per mile of $2,200 and set up a primary road mileage of 350,000 miles as against the currently designated state primary roads of approximately 324,000 miles, then the total yearly outlay on the primary road systems will reach $770,000,000.

Approaching now the less well-defined group of secondary roads, let us estimate a mileage of 600,000 and an annual average expenditure per mile of $1,000, thus arriving at a total of $600,000,000 required each year by the secondary road system. The grand total, therefore, amounts to $1,370,000,000 as the normal annual cost of the combined primary and secondary road systems, leaving a balance of $230,000,000 for local roads in the country's usual annual outlay of $1,600,000,000 on highways outside of municipalities, including interest on bonds and notes outstanding.

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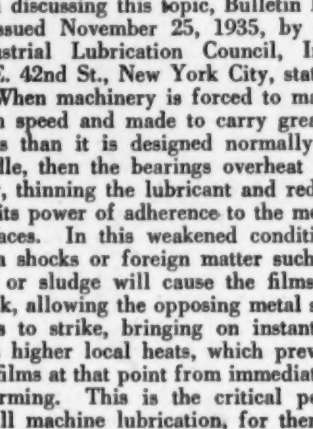


PUMP STRAINERS

All steel, non-breakable, with inner tube and threaded for self-priming pumps. Stock sizes 2", 4", 6" and 8".

Also bolted flange type for sump and pumps on fixed location, up to 24" suction. Ask for circular.

RIFE HYDRAULIC MFG. CO.
75 West Street New York, N.Y.

Keep All Your Highways at Work

GOHI
PRONOUNCED "GO-HIGH" CORRUGATED PIPE
GOHI CULVERT MANUFACTURERS, INC., NEWPORT, KY.

WHATEVER the type or location of the road, drainage problems are permanently solved when you install GOHI Corrugated Pipe which, for more than a quarter-century, have been writing their service records *in the ground*.

Such performance is the commonplace experience, however, because GOHI Pure Iron-Copper Alloy is the longest-lived, low-cost ferrous culvert metal produced.

Your drainage dollars buy their greatest value when you use GOHI. Consult any of the fabricators listed below for complete details.

●

New England Bolt Co.
Everett, Mass.

Central Culvert Co.
Ottumwa, Iowa

Capital City Culvert Co.
Madison, Wis.

F. Yeager Bridge & Culvert Works...Port Huron, Mich.

Bancroft & Martin Rolling Mills Co....S. Portland, Maine

Denver Steel & Iron Works Co.
Denver, Colo.

The Lane Pipe Corporation
Bath, N. Y.

Dixie Culvert Mfg. Co.
Little Rock, Ark.

The Newport Culvert Co.
Newport, Ky.

St. Paul Corrugating Co.
St. Paul, Minn.

(35)

All-Wheel-Drive Tractor Hauls New Dump Wagon

A new hauling combination for dirt movers has been developed by the Marmon-Herrington Co., Inc., Indianapolis, Ind. and Insley Mfg. Corp., Indianapolis, Ind. This new unit, capable of hauling a gross load of 25,000 pounds, consists of a Marmon-Herrington all-wheel-drive Ford V-8 truck-tractor and the new Insley semi-trailer dump wagon. The complete unit including both tractor and semi-trailer weighs slightly more than 8,500 pounds. Subjected to numerous tests before it was exhibited at Cleveland and at the Purdue, Ind., Road Show, the unit showed that it could negotiate a grade of more than 28 per cent with a payload of 17,500 pounds. The overall length of the unit is 26 feet 9 inches, and it has a minimum turning radius of 28 feet 3 inches. The capacity of the Insley semi-trailer is 5 cubic yards and it has an overall width of 86 inches. The tractor is equipped with 32 x 6-inch, 10-ply tires on both front and dual rear wheels while the dual rear wheels of the semi-trailer have 32 x 6-inch, 8-ply tires. Other tire sizes are available.

The semi-trailer has drop-bottom doors controlled from the cab by means of a clutch release and power wind-up. Although the semi-trailer has an exceptionally high dumping clearance, the power and traction of the tractor make it possible to pull over the load after it has been dumped as well as to negotiate rough, uneven terrain, either loaded or empty.

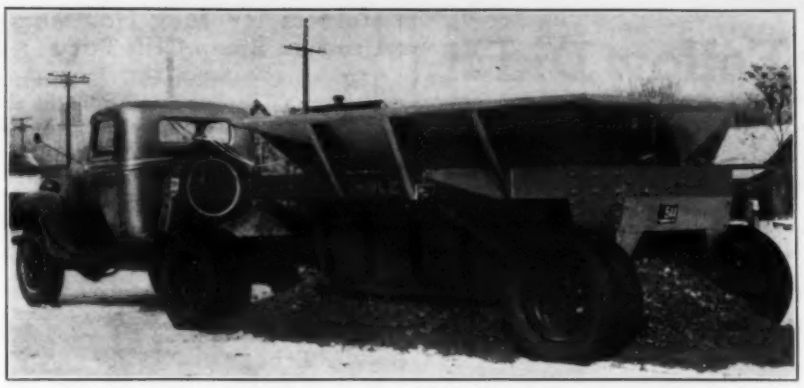
The tractor used in the unit is a standard 1936 Marmon-Herrington all-wheel-drive Ford V-8, Model B5-4 x 4 with a wheelbase of 132 inches. The driving front axle, two-speed auxiliary transmission and other all-wheel-drive parts are built into the truck by Marmon-Herrington engineers in its factory. The semi-trailer is the Insley Model No. 74 only recently developed and placed on the market.

All-Roller-Bearing Shovel Has Faster Swinging Time

"With one hand on the dipper of the shovel, a man can swing the entire upper deck weighing 17,000 pounds" reported the Byers Machine Co., of Ravenna, Ohio, when asked about the new Byers-62 ½-yard shovel. It was hard to believe but they proved it at the Road Show. All because there are thirty-two Timken roller bearings so that the vertical and horizontal swing shafts, the deck shafts, also the swing, crowd and travel clutches operate with a minimum of friction. This roller-bearing construction is said to cut 10 to 15 per cent off the swinging time required, saving time for shovels, trucks and men.

Another feature of the Model 62 is that only three main assemblies and one shaft assembly in the lower deck are required to perform all hoisting, swinging, crowding, traveling and steering operations. All gears operate in oil. Power is applied direct to the hoist, swing, crowd and propel shafts, eliminating the friction waste of intermediary gears. The simplified chain crowd makes it unnecessary to take off or put on additional machinery, except the split chain drum sprocket, when changing from clamshell to dragline or shovel attachment and vice versa.

Two travel speeds are provided in both forward and reverse, low gear for 30 per cent grades and high gear for a speed of 132 feet per minute. The steering mechanism uses but one shaft assembly to perform all travel and steering operations. The crawlers can be steered to the right or the left in a sharp or long turn, in high or low gear while traveling forward or backward and can be locked from the operator's seat to prevent rolling backward while working. This machine has a modern-style larger cab with sliding doors and larger window area. A low-cost, pneumatic-tired, roller-bearing mounted trailer capable of speeds of 30 to 35 miles per hour is available for moving the Model 62 which can be loaded or unloaded by two men in ten minutes.



The Marmon-Herrington-Insley Dirt-Moving Unit After Dumping a Load

New Assistant Manager for G-E Sales Division

W. H. C. Smith, formerly Manager of the Code Wire Sales Section of the General Electric Co., has been made Assistant to J. H. Crawford, Manager of the Construction Material Sales Division, Bridgeport, Conn.

THE NATIONAL CARBIDE V-G LIGHT

Gives you daylight conditions on night jobs.

Spreads a full, even beam of 8000 candlepower right where you need it.

HINGE JOINT

Lights up the job for twelve hours on one 7-pound charge of National 14-ND Carbide and 7 gallons of water. Is easily handled by one man; has nothing to get out of order; no harm done if it tips over—just stand it up again, and it goes right on working. Weight 35 lbs. empty; 98 lbs. when full.

Write for catalogs on V-G Light, V-G Handy Light and Lantern

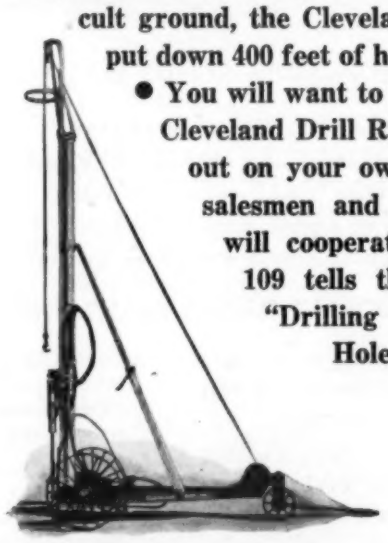
X-100

NATIONAL CARBIDE SALES CORP.
LINCOLN BLDG. (Opp. Grand Central) NEW YORK

GRUNDY

● The drilling on this railroad job near Grundy, Virginia, was as tough as any wagon rig ever tackled. All holes were started in overburden varying from a foot to ten feet in thickness. The ground consists of strata of sandstone — some soft — some hard and abrasive — shale, slate, coal, and hard blue clay. But in this difficult ground, the Cleveland WDA-10 put down 400 feet of holes per day.

● You will want to know how a Cleveland Drill Rig will work out on your own job. Our salesmen and distributors will cooperate. Bulletin 109 tells the story of "Drilling Ten o'Clock Holes in Rock."



Did you get a copy of the "Driller's Handbook"? It will be mailed free to bona fide rock drill owners and operators in return for the coupon filled out with the types and sizes of drills you are using.

THE CLEVELAND ROCK DRILL CO.

3734 East 78th Street Cleveland, Ohio

Besides Drill Rigs, or wagon drills, we manufacture

HAND HAMMER DRILLS
SINKERS, DRIFTERS, STOPERS
PAVING BREAKERS
PNEUMATIC DIGGERS AND TAMPERS
TRIPODS, COLUMNS
HOSE COUPLINGS
AIR VALVES
DRILL STEEL
PAVING BREAKER STEELS
MISCELLANEOUS
AIR TOOLS AND ACCESSORIES

THE CLEVELAND ROCK DRILL COMPANY,
3734 East 78th Street, Cleveland, Ohio.
Gentlemen: Please send me the "Driller's Handbook."

Name .....
Company .....
Address .....

We are now using the following makes and types of machines:

Hand Hammer Drills.....
Paving Breakers.....
Clay Diggers.....
Back Fill Tampers.....
Wagon Drills.....

LEADERS IN DRILLING EQUIPMENT

How the Other Fellow Did It

Ideas Which Have Already Proved Helpful to Contractors

Device for Traffic Lines

376 The specifications on a 1.791-mile NRH concrete paving contract called for a white traffic strip along the center line of each 20-foot slab. This marker is composed of Medusa white cement and white sand and is 8 inches in width. Built into the slab immediately and directly behind the finishing machine, this work has heretofore been a rather difficult job as it is necessary to obtain a straight line with neat edges without the white concrete and the gray mixing.

For use on this project, Frank Creason, a member of the firm of McGlone Paving Co., contractor for the job, invented a metal device 12 feet in length which serves as a form in which to deposit the white concrete. The device is 1 inch deep and holds the proper amount of white mixture for the marker. The device is mounted on a special steel bridge, which is hand-propelled by a chain sprocket and crank. The installing device is mounted on the bridge with a hand screw adjustment at each end.

The installing device is lowered in a groove which is provided by embedding a 1-inch x 8-inch board in the concrete just ahead of the finishing machine. The finishing machine screeds all the concrete down flush with the board. Then the board is removed and the installing device is placed in the groove and filled with white concrete, using a 1:2:3 mix. The bridge is then propelled forward slowly a distance of 12 feet. During the travel of the bridge, the installing device presses the white concrete into the gray concrete and also trowels and edges the white as well as the gray concrete, thus eliminating all hand finishing. The work is done by one man and a helper where heretofore from five to ten men have been required and they did not always do a neat job. 525:35

Old Coupe Sees Service in Building Sewage Tank

377 Providence, R. I., has recently completed the conversion of its old sewage works into an activated sludge plant. This necessitated ingenious design and still further ingenuity in the handling of construction equipment by the contractor, the Tucker Construction Co., of Providence, R. I. All new work was poured with ready-mixed concrete delivered to the job in 3¾-yard transit-mix units mounted on 5-yard trucks which were driven in the old distributing channel which is 10 feet wide and 660 feet long. It was necessary to cut out the side walls preparatory to raising their height and this provided clearance for the trucks. The concrete was placed through semi-circular chutes to the forms or to 6-cubic foot buggies and wheeled away for pouring.

For setting the air diffusion plate holders and air pipe as well as the cast iron columns for supporting the baffles in the tank, an old Winton coupe with a hand-operated crane mounted on a platform built on the back was used most effectively. The coupe was picked up by a big crawler crane and placed in a tank where it moved around under its own power. Then when its job was finished, the crane came along and picked up the coupe and placed it in another tank. Joseph Scallin was Superintendent in charge of the work for the contractor and was responsible for this ingenious unit.

Holders for Jack Hammers Used on Steep Cliff Face

378 A practical kink in drilling operations is shown in the accompanying photograph of drilling operators on the face of the rock cut for the navigation locks at Bonneville Project on the Columbia River, for which the General Construction Co. and J. F. Shea Co., Inc., are the general contractors.

Into the face of this cut thousands of anchor rods are being sunk to a depth of 10 to 15 feet, their outer ends being hooked to be embedded in the concrete facing of the lock. Holes for these rods are drilled with Gardner-Denver jack hammers.

Working in a standing or sitting position on narrow stagings, it is laborious for the men to hold the weight of the hammer and exert the necessary thrust at the same time. Therefore, "bales" or stirrups have been made for the hammers out of small-diameter rod. A small pair of pulley blocks is provided, one end hooked to a rope suspended from above and the other to the stirrup. The operator can then adjust the height by pulling on the free end of the pulley rope. Fastening the rope after it is adjusted, one hand is then left free with which to support himself in position.

Stirrup Holders for Jack Hammers Used at Bonneville

PILE HAMMERS
and
EXTRACTORS
HOISTS — DERRICKS
WHIRLERS

Special Equipment
Movable Bridge
Machinery

Write for descriptive catalogs.

McKIERNAN-TERRY CORP.
19 Park Row, New York
Distributors in Principal Cities

A 3000 POUND STANDARD-CEDAR RAPIDS PORTABLE ASPHALT PAVING PLANT

Just as Iowa has lead the field in the production of large capacity portable crushing plants, we now offer greater portability in the STANDARD-CEDAR RAPIDS ASPHALT PAVING PLANT field. Here is an asphalt plant that is ACTUALLY PORTABLE. Built and moves in self contained sections, you eliminate the costly assembly and disassembly of an asphalt plant in the field. For no more money you can get the type of portable asphalt plant that you have always wanted — Get the STANDARD-CEDAR RAPIDS story.

• THE STANDARD-CEDAR RAPIDS PLANT THAT HAS EVERYTHING •

PORTABILITY—100% Portable as the upper structure and lower structure as well as the dryer are all built on their separate rubber tired Trailer chassis.

CAPACITY—From 500 pound to 4,000 pound pugmill capacities—greater capacities but with less horsepower —all extra angle drives have been eliminated—IT PRODUCES AT A PROFIT.

ADAPTABILITY—Can be arranged to handle any type of oil or asphalt paving and do it more economically than other types—Lower weights in proportion to capacity —fewer working parts.

ACCURACY — Accurate weigh boxes, spring or dial scales, electric timing and locking devices (patented), a plant that will produce an acceptable mix with any specifications — SIMPLE — STANDARD — STRONG.

A COMPLETE LINE OF PORTABLE ASPHALT PAVING PLANTS

IOWA MANUFACTURING COMPANY
CEDAR RAPIDS, IOWA

Highway Improvement 1925-29 and 1930-34

As an over-all picture of highway improvement, without distinction as to the degree or between types, Thomas H. MacDonald, Chief, U. S. Bureau of Public Roads, in speaking before the American Road Builders' Association, said that the base period 1925-1929 showed an average annual completion of 17,577 miles without Federal participation in the cost and 10,063 miles with Federal participation, a total of 27,640 miles.

The succeeding 5-year period, 1930-1934, shows an average annual completion of 22,068 miles from State funds without participation in the cost from Federal highway funds administered by the Bureau of Public Roads. The State funds in some states were increased through loans and grants administered by the Public Works Administration and also by support from the Federal Emergency Relief Administration. In addition, there was an average annual completion of 15,514 miles with the whole or a part of the cost met from Federal highway funds administered by the Bureau of Public Roads. Together, these total an average annual completion of 37,582 miles or nearly 10,000 miles per year above the preceding 5-year average. These averages, however, fail to show the major influences which the Public Works appropriation of June, 1933, and succeeding Federal appropriations have had in holding highway building to the high level for this period. For the two years 1933-1934 the average completion mainly through State expenditures dropped to 15,963 miles and for the same period the average mileage completed with the cost in whole or in part from Federal funds administered through the Bureau rose to 20,048 miles. Together, the average for this two-year period is 36,012 miles. Without the record for 1935 and 1936 the conditions are such that it may be predicted the same relative results will inevitably follow for those years.

For the years 1933-1936 inclusive, the Federal appropriations for highways are the major influence in holding the average annual mileage completion at a figure well above the average for the pre-depression base period and very close to the highest five-year average.

Semi-Trailer Dirt-Mover of 5-Yard Capacity

On a road job in Indiana recently, R. L. Harris, contractor, of Fort Wayne, Ind., used one of the new Insley Semi-Trailers in addition to several dump trucks. According to the manufacturer, the Insley Mfg. Co., Indianapolis, Ind., this Semi-Trailer hauled an average of six shovel buckets (approximately five yards) on each trip, or 45 cubic yards an hour as against an average of 20 cubic yards an hour for the rest of the fleet.

This entirely new unit, which was displayed at the Road Show in January, is 131 inches long, inside measurement, 74 inches wide and 67 inches above ground. The doors are closed by action of a wind-up drum and clutch on the jack shaft mounted on the rear frame, with power through a chain and sprocket connection to the rear wheel axle. The clutch and drum are controlled for winding up and dumping by two lines running to the cab. The unit is attached to a standard truck simply by bolting down the ball and socket bolster to the truck frame. Because of the ease with which the trailer may be attached and detached from a truck chassis, the truck itself may be used for other purposes when it is not engaged in hauling material.

New Industrial Engines Announced by Novo

A new line of industrial engines has recently been announced by the Novo Engine Co., Lansing, Mich. The horsepower delivered by these engines, which have been on test for two years, in proportion to their piston displacement is in keeping with the modern trend and is held at the maximum by anti-friction bearings throughout, proper piston fit, adequate lubrication, correct cylinder head design, coordinated valve timing, well-proportioned manifolding and other features.

The maximum torque of these engines is so placed in respect to the normal speed to make them particularly adaptable as "luggers" in the industrial field. They will not stall when the load comes on but carry it over the peak, according to the manufacturer.

The C line of engines will at first be composed of two 2-cylinder engines, 2¾ x 4 and 3¼ x 4, and two 4-cylinder engines, 2¾ x 4 and 3¼ x 4. Cooling is by radiator with thermo-syphon circulation, although water pump circulation may be added. The crankshaft and camshaft are equipped with New Departure ball bearings. They may be equipped with battery ignition when electric starter and generator are specified.

A 4-Cylinder Model C Engine

A Type and Size of Bucket for Every Need

Power-Arm
Power-Wheel
Multiple-Rope
Dragline

The Digging Demons!

Write for Bulletins

THE WELLMAN ENGINEERING CO.
7012 Central Ave., Cleveland, Ohio

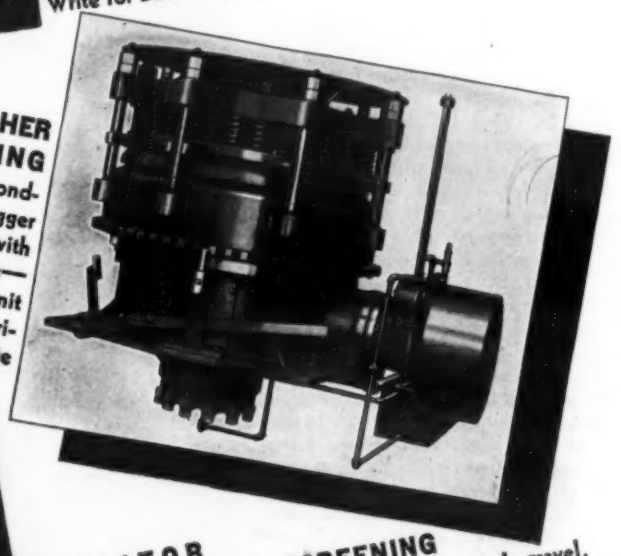
WILLIAMS BUCKETS

GREATER SPEED
LARGER CAPACITY
AND LOWER UP-KEEP

This 3-piece combination of Telsmith equipment is a striking example of group efficiency. Modern in every sense of the word . . . each piece is designed and built to better the product and cut operating costs.

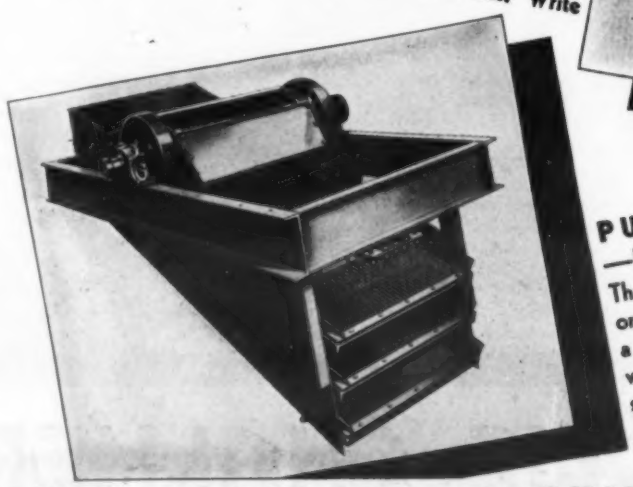
WHEELING JAW CRUSHER
—FOR COARSE CRUSHING

With its compact, rugged steel structure and cylindrical roller bearings, the Telsmith-Wheeling Jaw Crusher is ideal for coarse crushing. The roller bearings, force feed and higher speed almost double the capacity without any greater expenditure for power. Simple adjustment allows wide sizing range. Up-keep is reduced to a minimum. Write for Bulletin W-34.



GYRASPHERE CRUSHER
—FOR FINER CRUSHING

The Telsmith Gyrasphere takes the trouble out of secondary crushing. Working at choke feed, it turns out a bigger tonnage and more cubical product—crushes finer, with low power consumption and up-keep. The reasons—spring relief, rotary head support, spherical head, unit spring design, anti-friction thrust bearings, pressure lubrication, improved distribution of crusher pressures. Write for Bulletin Y-34.



PULSATOR
—FOR EFFICIENT SCREENING

The Telsmith Pulsator screens crushed rock, sand, gravel, ore or coal . . . wet or dry. Its circular movement produces a maximum screening action, uniform on every inch of the wire, on every deck, under any load. The toughest alloy steels, the finest anti-friction bearings and special labyrinth and piston ring steels (to protect working parts) give longer life and lower up-keep. Write for Bulletin V-34.

M-3

50 Church St. New York City
201 N. Wells Chicago, Ill.
1013 Commercial Trust Bldg. Philadelphia Pa.
605 Statler Bldg. Boston, Mass.
412 Westinghouse Bldg. Pittsburgh, Pa.
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L. V. Fraley & Son St. Louis, Mo.
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Associates in Canada: Canadian-Ingersoll-Rand Co., Ltd. Montreal, Toronto, Winnipeg, Vancouver

SMITH ENGINEERING WORKS
4014 NORTH HOLTON ST., MILWAUKEE, WIS.

TELSMITH

Sinking Caissons for Quabbin Dam

(Continued from page 1)

bars on each side of the caisson and one at the center of each end. Six similar bars surround each well and around the outside are 1-inch round horizontal bars spaced 12 inches apart. The vertical bars at the wells are held together by hoops of ½-inch round bars spaced 2½ feet on centers.

When the caisson reached rock and the rock was thoroughly cleaned, the bottom was sealed with concrete to 2 feet above the cutting edge before grouting. After grouting the concrete was carried to approximately 2 feet above the top of the working chamber and then the shafts were completely filled with tamped impervious material.

Caisson Excavation

Excavation within the chamber was carried on in three 8-hour shifts with a foreman and seven laborers in each working chamber. The record for sinking caissons was 10 feet 8 inches in one 8-hour shift, while the average was 6½ feet per shift.

Four sets of air locks were used on the job, the locks being shifted from one caisson to another in order to maintain a comparable speed of sinking from end to end of the core wall. The alignment and plumbing of the caissons were exceptionally good, there being only one caisson out of plumb to any noticeable extent and that amounted to only 12 inches.

For the first 16 feet of sinking of each caisson, the hand-loaded buckets 3 feet in diameter and 52 inches high holding about 19 cubic feet of earth were raised and tipped over, using two lines with the crane for dumping. From that point and before air was used in a caisson, that is before the ground water level was reached, a head frame was used with an electric double drum hoist to handle the buckets. There were six of these electric hoists, including Lambert, National and Thomas hoists, used on the job. Excavation and loading was done by hand throughout.

When rock was reached, a minimum of explosive was used, because of the possibility of damage to the lower part of the caisson. Most of the rock was removed by using I-R pneumatic drills with a pavement breaker in hard pan and decomposed rock, and plug and feather for the harder rock. Considerable ingenuity was necessarily exercised in minimizing the amount of rock excavation. Frequently, however, the foremen were misled by the presence of unusually large boulders slightly above the expected bed rock elevation. Upon "cleaning up" the rock, the character of the boulder was discovered and then it was drilled and blasted. In one instance, at least, an unusually long projecting ledge of rock was found with a re-entrant angle filled with hard packed gravel. It was found that it would not be necessary to move the considerable yardage of projecting ledge as it was sound rock and the excavated area beneath it was filled with carefully placed concrete.

Pumps and Compressors

The ground water across the valley was lowered by pumping from the three exploratory caissons, Nos. 7, 9 and 20, and also from No. 12 sunk under the present contract. There were three 800-gpm Cameron pumps with 40-horsepower motors located 120 feet below the top of the caisson in the working chamber. Two other similar pumps of 800-gpm capacity were located 90 feet below the top of No. 12 caisson. It is interesting to note that caisson No. 20, one of the exploratory units, put in in 1931, required 33 pounds of air pressure to keep out the ground water when it was sealed. This caisson was completely dry during the latter part of this contract because of the general lowering of the ground water by continuous pumping. This condition permitted sinking nine of the thirty-seven caissons in this contract without air locks.

Air for the locks and for the compressors was supplied from a central plant located about 850 feet from the center of the core wall. The equipment consisted of three 12 x 20 low pressure I-R compressors supplying air at about 50 pounds and one 8 x 12 I-R compressor supplying air at 125 pounds for drilling. An auxiliary compressor, a 1,600-cubic foot I-R machine, was placed at the center of the job as a booster on the line for high pressure service.

Grouting

Grouting of the caissons through the seal was specified in the contract. At least 2 holes, each carried 20 feet into rock, were drilled at the base of each shaft, the drills being set up just above the base of the shaft and the two lines diverging at about 23 degrees so that the holes where the drills punctured the seal were about 6 feet apart. Grout at 25 pounds pressure was applied with a Ransome grouter at each hole until the underlying rock would take up no further material.

Aggregate Production

Aggregate for the caisson concrete and for other structures was produced by the contractor from a 2-acre borrow pit adjacent to the dam. A Lorain 55 shovel of 1-yard capacity loaded three 1½-yard trucks which shuttled to the screening and washing plant about ¼-mile distant. The trucks backed up a wooden ramp and dumped over a 12-inch grizzly to the hopper beneath which led to a rotary

(Continued on page 34)

WISCONSIN GOE
SNOW-BOUND STATE RELIES ON
A-C POWER IN STORM CRISIS
89% OF TRACTORS PURCHASED
ARE ALLIS-CHALMERS!...
WHEN the real test came—Wisconsin dug out with Allis-Chalmers tractors. This was one of those "old fashioned" winters—raging blizzards ... heaviest snowfall in a generation ... fierce, shifting winds ... treacherous drifts ... temperatures down to 52 below. Equipment was taxed to the limit—none but the best could stand the test. It was no time for second-best machinery. That is why Wisconsin public officials specified Allis-Chalmers—33 A-C Tractors during those three trying weeks ... compared to four units of other makes.
WHEN DEPENDABILITY COUNTS — When highways are blocked, business stops. Milk, foodstuffs and coal cannot go through. Dependable equipment — to keep the roads open — pays for itself many times over.
POWER — It takes real power to buck big drifts. Where trucks and smaller tractors were helpless — A-C's plowed through.
DURABILITY — Less rugged equipment went to the shop for repairs — caused by the stresses and strains of heavy drifts against the plows. Under tests like this — A-C quality proved itself.
INSTANT STARTING — Only A-C Controlled Ignition Oil Tractors offer this advantage — instant starting on Diesel fuel oil, regardless of weather.
QUICK MANEUVERING — "Light on its feet" as well as powerful — able to turn in its tracks in close quarters. The operators appreciated this feature in A-C's.
TRACTION — There is no substitute for a track-type tractor when the going is toughest. A-C's have what it takes.
BOX SCO
THREE WEEKS' SN
A-C . . . 33 TRA
OTHERS . . 4 TRA
Wisconsin has "gone A
Chalmers" in a big
The same quality feat
and advantages that
A-C Tractors first c
in Wisconsin . . will
YOU to handle your
in less time . . at lower
ALLIS-CHALMERS OIL TRACTO
TRACTOR DIVISION—MILWAUKEE, U. S. A.

Latest Developments in Kinney Distributors

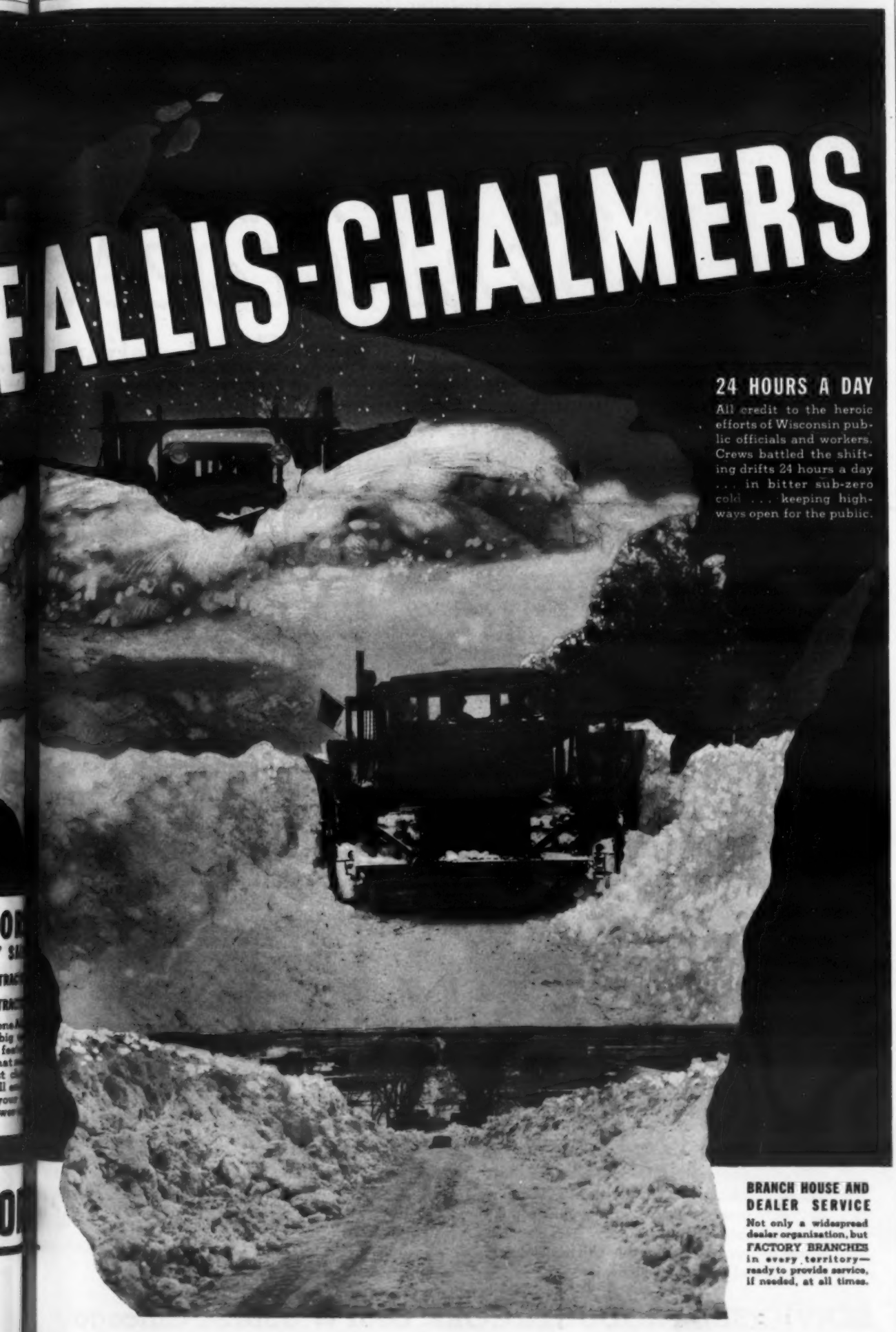
An examination of the Kinney asphalt and road oil distributor on exhibit at the Road Show in January showed several improvements which add to the accuracy of this machine made by the Kinney Mfg. Co., 3529-41 Washington St., Boston, Mass. A new tachometer has been placed on the pump shaft and a new governor speed control with micrometer adjustment has been placed where the distributor operator can make the finest adjustment in the volume of bituminous material delivered through the spray bar to the road.

The spray bar has always been cleaned by an air blow, and now the lever which controls the flow of asphalt to the spray bar, when pulled to the shut-off position, automatically hooks in the air blow which can be cut off at will by tripping the rod which holds the air blow control open.

The piping scheme has been simplified so as to eliminate about 40 inches of pipe, making for greater efficiency in the machine. There is a continuous flow of hot asphalt through all valves at all times through the use of three-way valve units.

The machine shown at the Road Show was a 1,000-gallon unit with a Hercules motor, mounted on a new streamline model 6-wheel White truck and had an unusually low center of gravity.

Locating, designing, construction and materials engineers must broaden their outlooks and see the whole economic picture of highway transport which begins with the public need for highways and includes financing, construction, maintenance and operation of the entire highway . system.—Prof. W. S. Downs, West Virginia University.


ALLIS-CHALMERS
24 HOURS A DAY
All credit to the heroic efforts of Wisconsin public officials and workers. Crews battled the shifting drifts 24 hours a day . . . in bitter sub-zero cold . . . keeping highways open for the public.
BRANCH HOUSE AND DEALER SERVICE
Not only a widespread dealer organization, but FACTORY BRANCHES in every territory—ready to provide service, if needed, at all times.

Lyndon Grange Hall Taken for a Ride

(Photo on page 44)

When one is driving over a new grading project one's eyes are wide open for new things that might be of interest to readers of CONTRACTORS AND ENGINEERS MONTHLY, but on a project practically completed one does not expect to swoop over the top of a hill and find his path blocked by a 25x56-foot building two stories in height merrily rolling along.

Taking advantage of the fact that the Melvern cut-off on U.S. 75 in Kansas was completed early in 1935 but not marked and opened to traffic, the local Grange in Lyndon decided it was a good time to move the Grange Hall 12 miles to a new location. It was jacked up, slowly rolled off its foundations onto three heavy timbers and then three dollies with four wide steel wheels each were run under the timbers and the Hall was ready to romp along the highways.

To pull this bulky load a good old Holt Sixty tractor was called upon. This machine, mated with the Best of California, was the grand-daddy of the present family of Caterpillars that handle all kinds of loads in many lands. Equipped with lugs, and there lies the secret of the trip over the new grade, the tractor snorted away and pulled the Hall over hills and across bridges to its new location. The secret? Oh, yes. All Kansas roads are marked with signs reading "Tractors with Lugs Must Keep off This Road," but this road had not been placed in service yet and the farmers pulled the lodge building to its new home in short order, before it would be necessary to take it apart and transport it piece by piece.

Chevrolet 1936 Trucks Include Many Advances

The 1936 trucks announced by Chevrolet Motor Co., Detroit, Mich., comprise a wide range of standard body types mounted on ½-ton and 1½-ton chassis. The design changes include a re-styling of the sheet metal and the adoption of a coupé type cab with a solid steel top. In the chassis the adoption of hydraulic brake operation in conjunction with improved brake mechanism at the wheels is of interest.

Engine improvements include increased power, better fuel and oil economy, and greater durability. The major change in the engine is the use of full-length water jackets, in combination with a higher compression ratio, 6 to 1. The engines of the two chassis models are identical in design and in horsepower and torque. The maximum horsepower is 72 at 3,200 rpm. At 1,000 rpm the horsepower is 30 and at 2,000 it is 57½. Maximum torque is obtained over an unusually wide range of engine speeds, 155-foot pounds being maintained from 900 to 1,500 rpm.

The 1½-ton chassis now has a full-floating rear axle and a stronger housing which includes a malleable iron differential case and seamless steel axle tubes. The rear axle loads are carried on the housing, instead of on the axle shafts, which now have only to drive the wheels. The steering gear on both models has been improved in action and durability by the adoption of a larger pitman shaft with longer bushings and a larger pitman arm. The front spring hanger of the 1½-ton truck has two safety stops, to limit the movement of the axle in case of spring breakage. These stops are heavy lugs on the hanger, allowing normal shackle movement but capable of taking the entire load should the main leaf of the spring break.

New 3/8-Yard Shovel of Heavy-Duty Type

The new Northwest 3/8-yard shovel, first displayed at the Road Show, is not just a machine built down to a size and price but is in reality a heavy-duty shovel with a 3/8-yard dipper. It has a live roller path with hook rollers between the travel and the rotating bases, usually found only on 2-yard machines and larger.

It is built with cast steel bases, fully enclosed travel gears, running in oil, a Ford V-8 motor with double cooling and an extra flywheel. All the high speed shafts are ball or roller-bearing-mounted and practically all gears are enclosed and run in oil.

This new product of the Northwest Engineering Co., 1730 Steger Bldg., 28 E. Jackson Blvd., Chicago, Ill., has the Northwest patented independent crowd with the crowd drum incorporated in the shovel boom base so that when the shovel attachment is removed to convert it into a dragline, it comes off as a unit.

This shovel weighs approximately 11 tons and includes a self-starter as standard equipment. It has one or two travel speeds and is equipped with the new orthopedic foot pedals so that the operator's feet are never out of normal position. It is fully convertible and full-revolving and has all-welded crawler side frames as well as an all-welded shovel boom and dipper stick.

The dipper has a manganese front and an all-welded patented back. The tail swing is only 5 feet 6 inches. The rotating base can be readily arranged for truck mounting. The crawler treads are the standard Northwest closed joint treads with no projections. The cab is full size and fully enclosed, offering complete protection and full visibility for the operator.

New Welder for Field Use

Among the new equipment exhibited at the Road Show in January was a new P & H 150-ampere welder mounted on an automotive-type trailer with pneumatic tires, designed particularly for field use. This two-wheel trailer unit can be hooked behind a car or truck to travel at average motor car speeds with ample protection against road shocks with a single steel plate mounting, cantilever springs and balloon tires. Large tool boxes are mounted on each side of the welder for convenience in carrying equipment and accessories.

A small air-cooled gasoline engine is direct-connected to the generator to deliver high electrical efficiency that enables the machine to use bare or coated electrodes from 3/32 to 3/16-inch for welding materials of varying thicknesses.

Complete information on this new welder may be secured by readers of this magazine direct from the Harnischfeger Corp., 4419 W. National Ave., Milwaukee, Wis.

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Literature and list of dealers on request.

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Waukesha Motor Co. Appoints De Long General Manager

James E. De Long, Executive Vice President of the Waukesha Motor Co., of Waukesha, Wis., has been appointed General Manager of the company. Mr. De Long has been connected with the Waukesha firm for 13 years, having joined the organization in 1923 as field engineer in charge of oil industry operations. De Long will also continue as head of the executive board, established in 1928 by the late Harry L. Horning. Other members of the board include J. B. Fisher, Chief Engineer, C. P. Ross, Assistant Secretary and Treasurer, J. G. Swain, Sales Manager, and A. S. Cronk, Director of Purchases.

Four New Catalogs on Mixers and Pavers

The Chain Belt Co., 1666 West Bruce St., Milwaukee, Wis., has just issued four new 1936 catalogs which will be of particular interest to contractors. These catalogs are: one describing the 3½-S and the 5-S mixers, a catalog on the 7-S and 10-S mixers, another on the 14-S mixer and one on the Rex 27-E paver. All of the catalogs show and describe the improvements in design and appearance of Rex construction equipment and any one or all may be secured by referring the specific size of mixer or paver in which you are interested and mentioning CONTRACTORS AND ENGINEERS MONTHLY.

A timely article on "Silicosis—Its Cause and Prevention"—will appear in our April issue.

Good Roads

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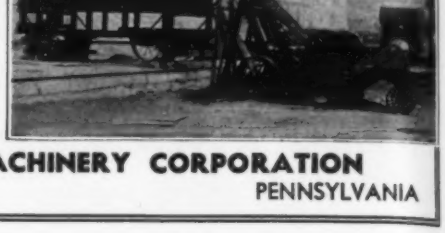

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Metal Accessories for Highway Construction

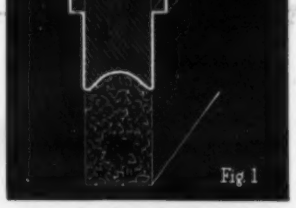
Fig. 1

FIG. 1

illustrates the metal housing for the fibrated asphaltic joint showing control of oozing of upper structure. The base is prepared from a non-oozing material.

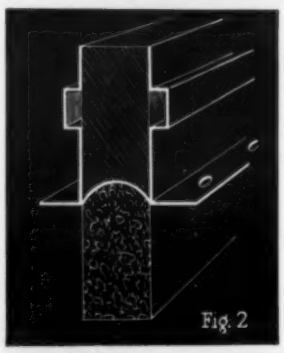
Fig. 2

FIG. 2

illustrates a fibrated asphalt top showing metal escape containers with a fibrated asphaltic top and a sponge-rubber, premoulded cork joint or fibre board base. The structure has an intermediate seal.

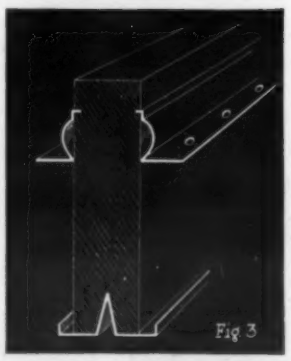
Fig 3

FIG. 3

illustrates a combination seal imbedded in fibrated asphaltic top and the escape apertures as well as the seal absolutely controls the fibrated asphalt flow. The base has a copper seal.

FIG. 4

illustrates an extruded fibre mastic product provided with grooves for the metal accessories used in connection with flow control. Escape dowel locks and supports and upper escape and seal combination control oozing tendencies in this joint. The metal forms contribute to the rigidity of the joint and afford a simple economical means toward a positive seal. The means of properly housing the dowel bars so as to hold the dowel bar in rigid position while the concrete is being poured is effective and certain.

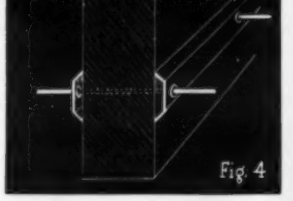
Fig. 4

FIG. 5

illustrates an upper seal which can be utilized with a backing board or with a prepared joint filler in which the joint may be poured or filled and a positive seal formed thereover. 5a-5b departures from 5.

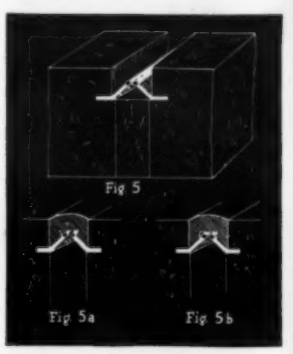
Fig 5

Fig 5a Fig 5b

FIG. 6

illustrates a separate metal housing seal.

FIG. 7

illustrates a metal form for the base seal.

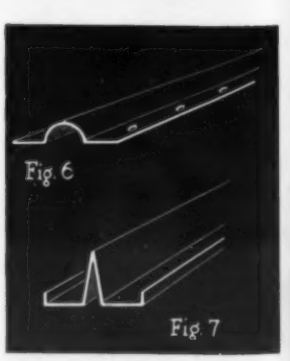
Fig. 6

Fig. 7

NOTE: All the benefits of a metal cushion joint are obtained and in addition a waterproof filler and seal with greater flexibility at lower cost.

In conjunction with the above, we furnish extruded fibrated asphalt material with the fibre content in greater relation to the asphalt content so as to furnish some resiliency. This material comes grooved with a suitable affixing of dowel supports and escape cushions.

We also furnish extruded sections such as curb cushions; bridge plank, mineral surfaced, standard and ribbed; and our metal accessories in conjunction with highway and bridge construction.

We specialize in extruded forms to meet various engineers needs.

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Hug Shows Innovation in Transportation Equipment

One of the entirely new pieces of equipment shown at the Road Show in January was the Hug Lugger, developed by the Hug Co., Highland, Ill., manufacturer of Hug Roadbuilder trucks. The Lugger is a six-wheel unit, powered by a Caterpillar Show-Down diesel engine, for use with trailer dump wagons, such as the LeTourneau Cradledump Buggy, the LeTourneau Slide-Out body, or a 12-yard dump truck body.

The chassis of the Hug Lugger is claimed by the maker to be an innovation in design and construction. The entire frame is electrically-arc welded. Trusses, spring hangers, motor hangers, radius rod braces, the front axle rocker and the box section cross members are all electrically-welded to the side rails, forming one massive, rigid structure.

The Model 100 is equipped with large pneumatic tires to provide positive traction and full-floating double reduction front and rear wheel drive axles, with high traction differential. The transmission and transfer case offer a combination of twelve speeds forward and three speeds reverse. With this coordination of units the Model 100 will move its total load at a speed of 15 miles an hour and will make the return trip empty at a speed of 28 miles an hour. The unit is equipped with air brakes on all wheels and has air-actuated steering. The Cradledump Buggy, the use of which with the Hug Lugger offers a heavy-duty high-speed carrier for long hauls, has a capacity of 30 yards.

In designing the Model 95, Hug engineers have combined the chassis, body and hoist into an integral 12-yard hauling unit, by converting two rear driving axles ordinarily used under a 6-yard truck, into a front and rear axle drive and adding a 6-ton trailer axle as a center axle. Both front and rear axles are driving axles and are of the double reduction full-floating type with high traction differential. Positive traction is obtained by four large tires, 18-inch cross section by 61-inch outside diameter and two smaller tires, 12-inch cross section by 48-inch outside diameter. The center steering axle, mounted between the driving axles, is not only a load-carrying member, but by steering in tandem with the front driving axle, combines load-carrying capacity with short turning radius. Both front and center axle steering is air-actuated, giving practically passenger car ease of handling.

The new 12-yard Hug Scoop-End body with which the Model 95 Lugger is equipped is rigidly enforced with one-piece U-shaped I-beam ribs of steel. To facilitate complete discharge of the load, the body is equipped with a special power hoist that has a dumping angle of 75 degrees. This hoist is the full compensating type, double-lifting arm with double three-point suspension. The hoist is double acting in operation, directly reversible, and the hoist valve

The Model 95 Hug Lugger With 12-Yard Scoop-End Buggy

is so designed that the hoist will remain constant at any degree of dumping angle.

In addition to the Hug Scoop-End body, the Model 95 is also available with a 12-yard specially-designed LeTourneau Slide-Out body, which eliminates the use of a power hoist. The four sides of the bottomless body slide back off the bed, instantly starting the unloading process, forcing the load to travel with it and expelling even the stickiest mud.

New Paint Spray Gun

A paint spray gun in which cleaning is only a matter of a few seconds, as a single-unit detachable spray head contains every part touched by the paint, has been announced by the Paint Spray Equipment Division, The Alexander Milburn Co., 1409 W. Baltimore St., Baltimore, Md. This Type MM spray gun is precision-built and balanced like a pistol. The spray head is made of drop-forged bronze machined with precision and exact alignment. The gun handle and body are one piece, die cast aluminum alloy, a dense but lightweight material with a long life.

The standard air hose connection, located at the base of the handle, is designed for ease of handling and to prevent tangling of the air hose or obstructing the adjustment controls. The atomizer head is of one piece. A two-finger grip trigger operates the fluid and air control valves which are set so that when the trigger is pulled, air is first admitted into the spray head, then the fluid; when the trigger is released, the fluid needle valve closes first, then the air valve, preventing weeping or spattering when the fluid is turned on.

A knurled adjusting nut operates a non-corrosive needle valve to regulate the air flow to the atomizer head. This controls the spray volume and the shape of the spray, whether flat or round. Another knurled nut adjusts the fluid flow by means of a stainless steel needle valve. The valve is closed by a tension spring when the trigger is released, assuring tight seating under high fluid pressures.

Pittsburgh Office Moved

The Lincoln Electric Co., Cleveland, Ohio, has announced that its Pittsburgh office, formerly located at 323 Fourth Ave., has been moved to larger quarters at 926 Manchester Blvd., close to the heart of the city. F. M. Maichle is District Manager and W. R. Persons and H. E. White, Sales Engineers.

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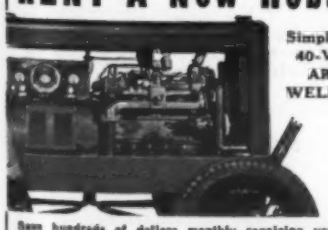

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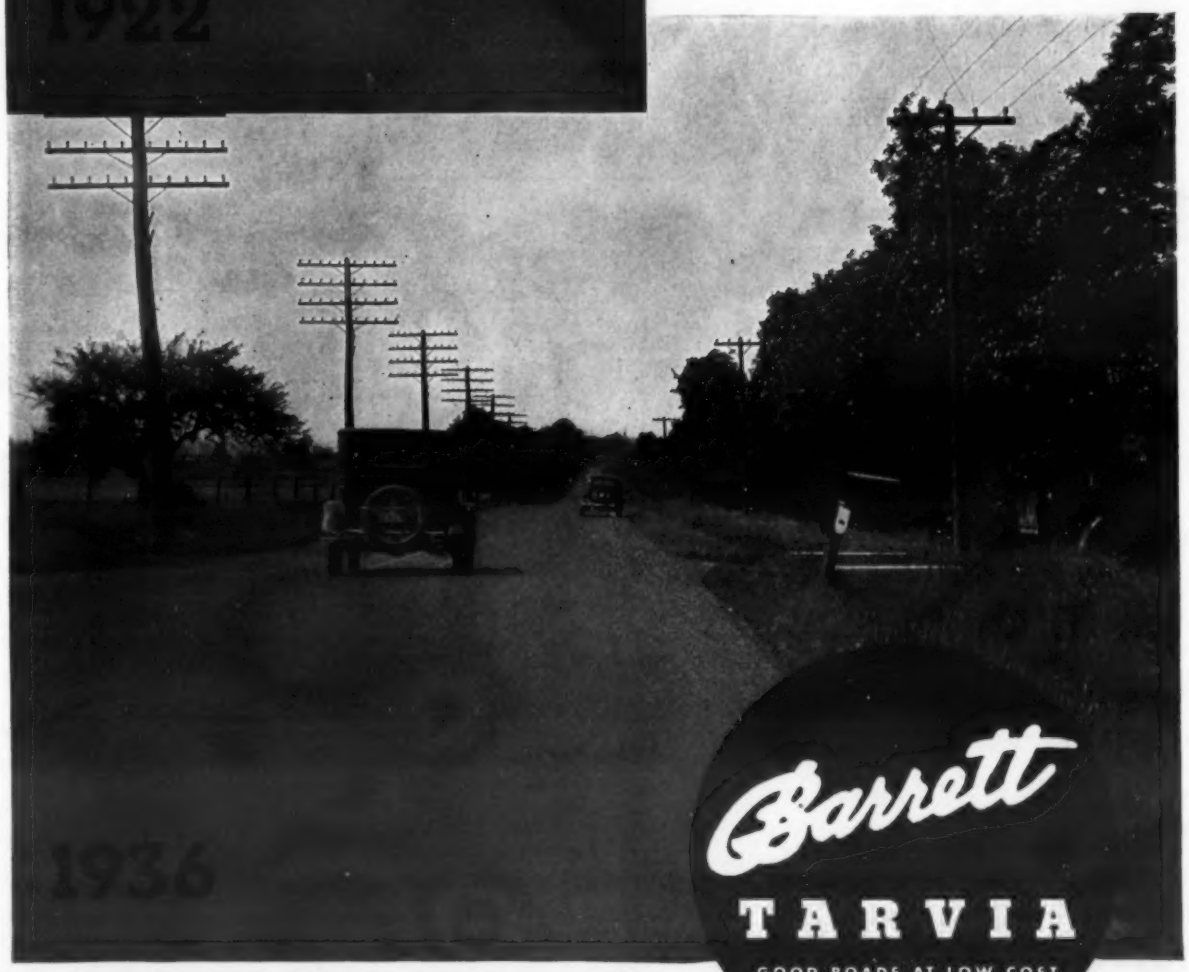
THE TECHNICAL SERVICE BUREAU of The Barrett Company invites your consultation with its technically trained staff, without cost or obligation. Address The Technical Service Bureau, The Barrett Company, 40 Rector St., New York.



Kennedy Road, near Unionville, York County, Ontario, Canada. Tarvia-built, 1922, and as completely satisfactory today, for 1936 automobiles, as it was the year it was built.

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Roads of Europe May Lead to War

(Continued from page 15)

tractors. Practically all of the materials used in construction are obtained locally, except asphalt, large quantities of which are imported, mostly from the United States. Practically all equipment in use is manufactured in Italy, although a few American made snow plows and shovels are in use at this time.

Future Road Building in U. S. S. R.

The greatest amount of undeveloped territory in Europe lies in the U. S. S. R. In prewar Russia motor transport and automobiles were practically unknown. The total length of all roads suitable for any kind of vehicular traffic was 15,006 miles of which only 2,990 miles were paved. Prior to the first Five-Year Plan period the Soviet Union, applying the greatest part of its resources to the restoration of industry and railway transportation, did comparatively little toward building new roads. Nevertheless by 1928 the total length of roads suitable for automobile traffic had increased to 25,420 miles, of which 19,840 were gravel or paved roads and 5,580 improved dirt roads.

The U.S.S.R., with a population of 170,000,000 and a territory two and a half times that of the United States, has less than one-fifth the railway mileage. Hence the importance of developing motor transport as a supplementary means of transportation is self-evident.

Over one billion rubles (the ruble is worth about 15 cents) was invested in road construction during the first Five-Year Plan and a total of 57,660 miles of new roads were built, of which about 7,440 miles were paved. This was several times as great as the entire mileage of improved roads before the war and in a number of regions roads were built for the first time.

Building new roads and the improvement of thousands of miles of country roads have been going on steadily, according to the report on Motor Transport in the "Handbook of the Soviet Union."

Late in 1935 an administrative change was announced, transferring the control of all highway building to the Commissariat of Home Affairs and a tremendous road building program has been planned. Engineers are coming to the United States from Russia to study our road building methods and to secure data on U. S. road-building equipment which can be used in building the future roads of the U.S.S.R.

Great Britain

The total length of public highways in the British Isles is 177,822 miles, 86 per cent of which are in England and Wales and 14 per cent in Scotland. About 90 per cent of the roads are built of some form of macadam, although cement concrete is being used more extensively each year in the reconstruction of main highways. The amount of funds actually paid out of the road fund to counties and boroughs and other miscellaneous bodies for road purposes for the fiscal year 1933-34 was £13,158,000. Of this, England and Wales received £11,429,000 and Scotland £1,728,000.

There are 48,000 miles in the road system of the Irish Free State, practically all of them improved. Present road work consists principally of maintenance of existing roads, mostly of the macadam type. The annual amount expended on road construction and maintenance during the past five years has ranged between £2,000,000 and £2,500,000. All repairs and improvements are carried out by local authorities, either directly or by contract. Extensive reconstruction projects are carried out by private contractors.

France and Belgium

In Europe proper, France has the greatest highway mileage, 399,761 miles, about 97 per cent of which are macadam and in excellent condition. There is a fair mileage of Durax granite cube paving and a very small mileage of concrete paving. There is no brick shale or clay in Europe but France has a few brick pavements laid with brick from Algiers. Like the other older countries, France has but little construction on entirely new routes, although the important main roads through France are undergoing considerable reconstruction and other improvements to care for the intensive traffic. National credits for the repair and maintenance of roads in France in 1934 amounted to 929,000,000 francs (the franc equals 6.5 cents). A five-year construction plan is under way for the relief of traffic in the Paris area, consisting of tunnels, widening and the reconstruction of bridges. The entire project is estimated to cost 150,000,000 francs.

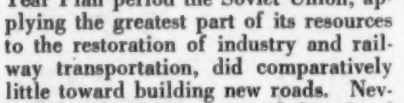
During 1934 and 1935 there developed in Belgium a general demand for the improvement of arterial routes and of one type of construction. Most of the available funds have been devoted to this phase of its highway system, with added emphasis on highway improvement as a means of reducing unemployment. All important routes are hard surfaced.

For the year 1935 the ordinary budget contained provisions for 55,000,000 francs (the Belgian franc equals 3.2 cents) for national roads, 7,000,000 francs for salaries and control offices and 850,000 francs for state aid to local governments. The extraordinary budget provided another 60,000 francs for the upkeep and maintenance of roads. With certain other allotments, the total at the disposal of the government in 1935 was 282,850,000 francs. The dense population and intensive industrial development of Belgium have been the main factors in the development of its highway system and in a use of motor vehicles far greater than that of most European countries.

Austria and Hungary

Notwithstanding the economic condition of Austria during the past three years, considerable progress has been made in highway construction and improvement. In 1933, a loan of 60,-

(Continued on next page)



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The engine—a Model VBKH Waukesha-Hesselman, 4½ x 5¼ bore and stroke, piston displacement 334 cu. in., four cylinders, developing 40-50 hp.—is equipped with overhead valves and removable cylinder head, full pressure oiling, wet sleeve renewable cylinders, American Bosch and Hesselman injection system, and all other features found in the largest Waukesha-Hesselman Engines.

Hesselmans are low compression, solid injection, spark ignition oil engines, burning "modern high-speed Diesel fuels". . . about the same size and weight as gasoline engines and equally simple in construction . . . 20 hp. to 300 hp., both four and six cylinders. *Write* today for Bulletin 1000. *Waukesha Motor Company, Waukesha, Wisconsin.*

WAUKESHA ENGINES

Roads of Europe May Lead to War

(Continued from preceding page)

000,000 schillings was consummated and appropriated for the construction of new roads and the amortization of existing routes. At the end of 1934 more than 59,000,000 schillings of this fund had been expended. In addition, a further 10,000,000 schillings was provided for road maintenance. The schilling equals 18.8 cents.

The Gross Glockner Alpine highway, the culmination of ten years of effort by Austrian engineers, was opened in 1935. This highway, an important link between points in southern Germany and northeastern Italy, is a 30-mile stretch around the crown of the nation's highest mountain, Gross Glockner, and reaches a maximum elevation of 7,500 feet above sea level.

The road program of the Austrian Government for 1935 called for an expenditure of 47,761,000 schillings and it has been reported that the appropriations for 1936 will approximate that for 1935.

Hungary has a road system of approximately 18,000 miles, of which about 11,500 miles are waterbound macadam, about 600 miles are of penetration macadam, 100 miles of cement concrete and 1,200 miles of block, stone, wood, asphalt and brick roads. The new Minister of Commerce plans to spend $40,000,000 on new construction. At present there are no funds for this work but it is proposed that the money needed be advanced by contractors and payment divided over the six-year period during which time the items will be included in the state budget. The 1934-35 fiscal year state budget provided 2,209,000 pengo (the pengo is worth about 16 cents) for maintenance of state highways, 662,000 pengo for improvement of roads, a subsidy to village roads of 200,000 pengo, 9,353,000 pengo for the reconstruction of state highways and 500,000 pengo for bridges.

The Buffer States

The Government of Estonia, through its Ministry of Communications, finances the construction and maintenance of its 15,489 miles of roads from a road fund derived principally from a Government subsidy and from gasoline and motor vehicle taxes. It is estimated that there will be available during the fiscal year 1935-36 about 3,233,000 kroner. Roads not maintained by the Government are repaired by farmers and landowners in their immediate vicinities, mostly by the application of gravel surfaces. The Government has considerable road-building equipment, and has set aside 200,000 kroner for the purchase of additional machinery this year, about 49,000 kroner of which will be spent in the United States. The kroner is worth about 22 cents.

According to the Ministry of Communications, under which the state roads are supervised in Poland, it is proposed that during the budget years of 1935-36 and 1936-37 about 558 miles of roads will be surfaced at a cost of 9,000,000 zlotys. (The zloty is equal to 18.8 cents.) It is also proposed that 142.6 miles of new roads be built at a cost of 10,250,000 zlotys, to be financed by credits from the road fund, the labor fund and the Premium Investment Loan of 1935. In addition to this improvement, an ambitious six-year program has been prepared, which contemplates the reconstruction and improvement of 2,914 miles at a cost of 325,000,000 zlotys, spread over the six-year period. This plan also includes the maintenance of 12,400 miles at a cost of 240,000,000 zlotys and state aid to local governments during the same period of 74,000,000 zlotys. This is the first comprehensive program of highway development that Poland has adopted.

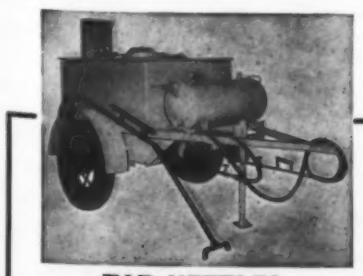
The Balkans Lack Funds

Albania reports 1,116 miles of roads, of which 559 are macadam surface treated with asphalt penetration and 557 miles of earth, sand-clay and gravel roads. During the past few years both construction and maintenance have been badly neglected and at present roads under both classifications are reported to be greatly in need of repairs, due to the financial and economic conditions which have prevailed in Albania for three years.

The highway budget of Bulgaria for 1935, under the supervision of the Ministry of Public Works, provided about $1,450,000 for construction and $983,000 for maintenance of roads in that country. A new highway law of 1934 set up a special road fund for the construction and maintenance of the national highway system, under which law the present exchange rate subsidy will be about $725,000 annually. In addition to this, taxes and other miscellaneous sources of income will provide about $3,000,000 each year in the future, exclusive of the state subsidy mentioned above, showing that Bulgaria is committed to an extensive highway improvement program. However, due to the unsatisfactory economic situation it will not be possible to spend large sums for highway work, but since labor is cheap and there is also a system of compulsory labor which can be used, considerable work will probably be under way this year.

The road system of Czechoslovakia has been under rather intensive development during the past few years. In 1935 the state budget provided 105,572,000 crowns for state roads and bridges and a road fund for state roads, subsidies for improvement of non-state

(Continued on page 41)



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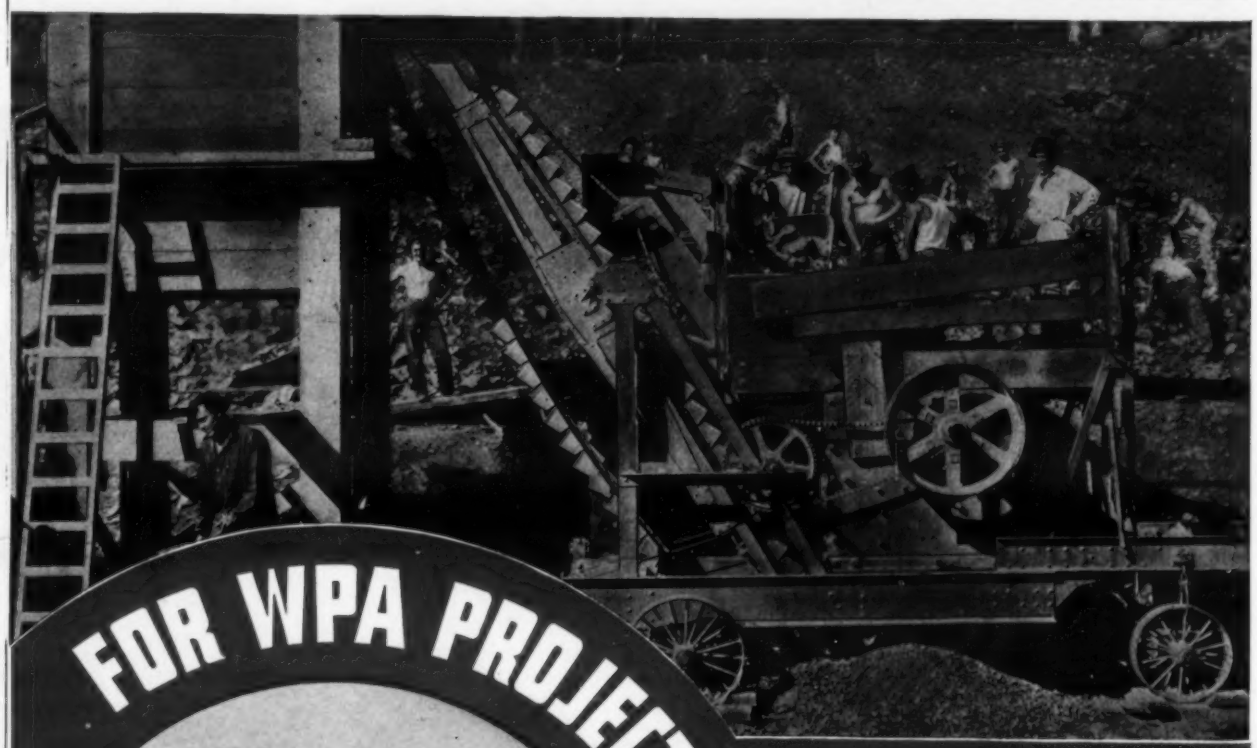

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The No. 100 Plant with the 940 Primary Breaker and 440 Reduction Crusher (roll crusher available, if desired) provides the greatest possible production of material, yet it is compact and easily transported under motor truck power.

The small Austin-Western Portable Crushing Plants provide big production, easy portability, low operating cost.

Designed for local pit aggregate, these compact units have the same high quality throughout as the large No. 70, 80, and 100 plant; jaw openings—from 9" x 16" up to 18" x 38"—oversize shafts mounted on SKF roller bearings—steel plate frames—unusually deep jaws.

These and other features provide big volume for day in and day out operation without delays or breakdowns.

Austin-Western's complete line of portable crushing, screening and gravel washing equipment permits the selection of the equipment which meets your requirements exactly.

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From Cut to Fill Through Long Chute

By HENRY W. YOUNG

M. S. Ross, Contractor, Handled 642,790 Yards of Cut on 1.737-Mile Road Job in Wash.

CONTRACTOR M. S. Ross of Los Angeles and Grand Coulee completed last fall a very interesting section of the new state highway between Olympia and Tacoma, Wash., known as the Olympia-Nisqually Cut-off. While the contract was for only 1.737 miles, it contained a very deep cut and a channel diversion 4,200 feet in length, McAllister Creek. The channel change amounted to 60,000 cubic yards of unclassified excavation and the cut to 642,790 cubic yards. In addition, there were two treated pile and timber trestles with reinforced concrete decks, and four bridges across the creek for farmers' use, besides clearing and grubbing over the hill through which the cut was made. Ross was very busy with his mile and three quarters from January 3, 1935 to about October 1.

The site of the big cut overlooks the creek bottom where the channel change and fill were made. It is, in fact, one of the largest highway cuts made in the state of Washington. The material was all gravel, with a small amount of clay mixed, coming out just wet enough to pack well on the 4-foot layers in which the fill was made. Six per cent grade was maintained over the fill and through the cut, the cut having a maximum depth of about 90 feet.

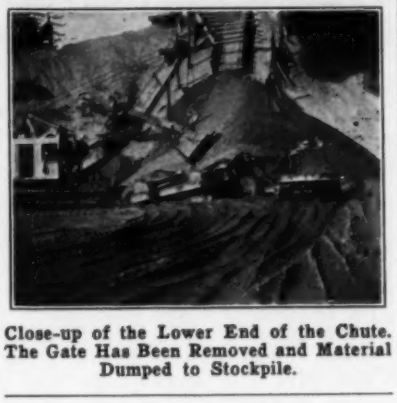
Chute Solves Problem

In the initial operations, a chute was used, after the manner often employed in railroad practice but not common in highway work. This was built on the hillside facing the cut, and at an angle such that the material would flow down readily by gravity. The lower end was near the bottom of the hill where it could easily be reached by trucks, while the loading platform at the top of the chute was slightly below the crest of the hill but was also readily accessible to the trucks.

When the chute was completed, the shovels were started at the top, the excavated material trucked to the loading platform and dumped down the chute. Trucks at the bottom received the material, let out by means of a gate in the chute and hauled away to the fill. As the cut deepened, the chute was cut off at the top, and as the level of the fill rose it was cut off at the bottom. Finally, when the level of the bottom of the cut came sufficiently near to that of the top of the fill, so that a truck ramp could be built from one to the other, the chute was dispensed with, and the shovels loaded direct to pile or to the trucks hauling to the fill.

In building the chute, log piles were first driven to support it. The sides and bottom of the chute were then constructed of 4 x 12's, with a lining of ⅜-inch boiler plate. The dimensions of the chute were 8 feet wide by 4 feet deep. The total drop was 135 feet on a 1 to 1 slope.

The gate at the lower end of the chute was both raised and closed by means of an electric hoist with reversible drum, so that the action was positive. A short chute or spout took the material from the gate a load at a time and deposited it in the trucks, thus speeding up the transfer of material.



Close-up of the Lower End of the Chute. The Gate Has Been Removed and Material Dumped to Stockpile.

A Correction

In the article "Good Roads Make Good Neighbors" which appeared in the January issue of CONTRACTORS AND ENGINEERS MONTHLY, there was an error in regard to the personnel in charge of the engineering work for the Inter-American Highway. All of the engineering work from the beginning of the reconnaissance survey has been under the direction of the U. S. Bureau of Public Roads, the work being carried on under the immediate supervision of the Division of Highway Transport, of which E. W. James is Chief. The actual performance of the work throughout Central America and Panama is under the personal supervision of D. Tucker Brown, Senior Highway Engineer. C. B. McCullough is Bridge Engineer, John K. Flick, Office Manager for the Inter-American Highway Office recently opened in the city of San Jose, Costa Rica, Raymond Archibald is Structural Designer and the three field parties operating at present are in charge of O. E. Malsbury, Thomas A. Jones, and A. K. Haxstun.

The entire local county debt, including roads and schools, for the State of Minnesota at the present time, is $83.79 per capita; the State debt is $45.91 per capita; and the national debt is $241.09 per capita.

USE RIGHT BUCKET FOR THE JOB

Hayward makes all four — clam shell, drag-line, electric motor, orange peel. A Hayward recommendation is unprejudiced.

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THE HAYWARD CO., 22-36 Dey St., New York

HAYWARD BUCKETS

On price alone, or on specifications alone, or on the still sounder basis of its ability to outperform and out-earn this rugged GMC truck is an unequalled value.

Greater Power—Increased horsepower and increased torque for more work . . . in fact a larger engine than ever before in a GMC at this low price . . . efficient valve-in-head design, of course, and many refinements that assure ample power for every demand.

Improved Performance—Engine improvements, transmission improvements, rear axle improvements, refinements throughout the entire truck, assure the kind of performance that will fully satisfy the most exacting truck operators.

Streamlined Appearance—One glance at this GMC 3-ton value for 1936 and ten to one you'll say its advanced streamlined appearance—in the all-steel "helmet top" cab as well as in the chassis—sets it apart as a truly distinctive vehicle.

Driver Appeal—In addition to the many chassis refinements that contribute to the driver's physical and mental comfort there is likewise a roomy, comfortable cab with many conveniences such as advanced features of ventilation, that will improve the efficiency of any driver.

Dual Performance and other money-saving advantages—Throughout this exceptional truck are features that shrewd operators will be quick to value in a dollars-and-cents way. And available also is GMC dual performance rear axle which saves gas, lowers upkeep costs, saves oil, saves time and lessens wear.

General Motors Trucks and Trailers

General Motors Truck Company, Pontiac, Michigan

New Highway Bridge to Be Built in Texas

(Continued from page 16)

length from abutment to abutment is 7,752 feet.

The bridge provides for two-lane highway traffic and has a width of 25 feet, 6 inches between hand-rails; 22 feet, 6 inches between curbs; with a curb 18 inches wide at each side providing emergency safety sidewalks.

The roadway floor will be of reinforced concrete, having a surplus thickness and finished as a concrete pavement. Curbs over the through spans will be of steel; elsewhere of concrete.

Features of Design

Unique features of the design arise from the location of the structure in an area subject to tropical hurricanes and the consequent provision in design for a wind load of 75 pounds per square foot; and from the extremely soft subsoil conditions with marsh muck extending down from depths of 30 to 45 feet.

The wind loads, particularly as considered in quartering and longitudinal effects, were a large factor in determining the design both of the superstructure and the substructure. The horizontal shears from wind loads on the piers and the problems of designing the piers for adequate lateral stability made desirable minimum elevation of the pier tops. Piers under the central span have a height 20 feet above mean Gulf level, and other caisson piers 11 feet.

The substructure of the through cantilever span and approach spans and for the 300-foot deck truss spans consists of eight caisson piers, each comprising two separate cylindrical piers to be sunk by combined open dredging and pneumatic process to hard foundations at depths 90 to 100 feet below mean Gulf level.

Substructure for the other spans consists of pedestals of reinforced concrete with timber foundation piles carried down to hard material, to be driven with carefully determined batters to provide for transverse loads.

Each portion of the caisson piers is a circular reinforced concrete hollow cylinder with sealing course of concrete at the bottom and solid shaft construction at the top. The interior portions of the cylinders will be filled with water.

Superstructure spans are supported on towers forming integral parts of the trusses and competent to carry the wind shears down to the tops of the piers. The lateral spread of the towers under the main span is 110 feet.

Lateral distances between centers of the cylinders of other caisson piers, and between pedestals is consistently reduced as the height of the structure is reduced.

There will be about 23,000 cubic yards of mass of caisson pier bases; about 3,500 cubic yards of shaft and caisson piers; 7,800 cubic yards of other concrete in foundations, and 1,500 foundation piles. The superstructure will include about 10,000 tons of steel, in part of silicon, and there will be about 7,000 cubic yards of superstructure concrete.

G. G. Wickline, for 17 years engineer with the Texas Highway Commission, is administering and directing the project.

Ash-Howard-Needles and Tammen of Kansas City and New York are consulting engineers.

End-Discharge and Tilting Mixers on Pneumatic Tires

For bridge building, curb and gutter and general construction work, Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio, has developed fast charging and discharge speeds in its 1936 line of two-wheel 10-S and 7-S Speed King mixers. Heavy 6 and 8-ply industrial pneumatic tires are used, two of these tires being said to provide double the load-carrying ground contact obtained with four of the solid or high pressure tires on which mixers of this size are customarily mounted. The pneumatic tires, and Timken bearing axle, make it possible to trail these mixers behind light trucks at speeds up to 35 miles an hour.

Streamlined tilting mixers are offered in 3½-S to 7-S sizes featuring the

The New Jaeger Pneumatic-Tired Speed King Trailer Mixer

Jaeger patented "Dual Mix" drum with V bottom on all models, a pneumatic-tired 3½-S trailer and a popular-priced 5-S size with two-wheel trailer mounting and end discharge adapted for work in congested streets, backing up to cellar windows and foundations, and pouring with a swinging spout.

A new catalog giving complete details of this 1936 line, which also includes non-tilting units in 7-S to 56-S sizes with skip shaker power loaders, plaster-mortar and cold-patch mixers, concrete buckets and a new type of pneumatic-tired concrete buggy may be secured direct from the company.

Minnesota Ranks First in PWA Road Mileage

According to a recent report of the U. S. Bureau of Public Roads, Minnesota ranks first in the mileage of improvements completed with Federal Works funds as of January 1. It stands in third place in mileage approved for construction by Federal engineers, and in tenth place in mileage under construction, with 1935 ERA funds. It also ranks third among all the states in mileage of highway improvements completed up to the beginning of 1936 with Emergency Federal funds provided by the National Industrial Recovery Act and the Act of June 18, 1934.

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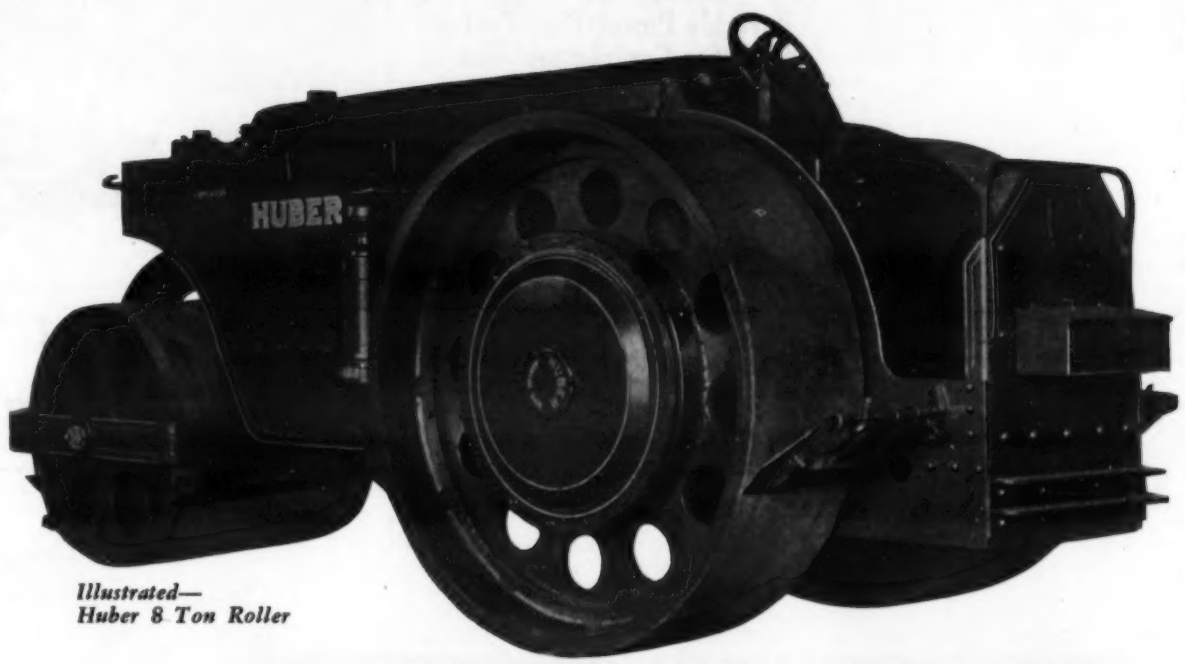

Illustrated—
Huber 8 Ton Roller

It's a HUBER

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- FOUR SPEEDS IN BOTH DIRECTIONS
- SIMPLIFIED CONTROL
- REPLACEABLE ROLL RIMS
- DUAL STEERING HAND AND POWER
- HYDRAULIC SCARIFIER
- SHORT WHEELBASE
- ROLLER BEARINGS THROUGHOUT
- RIGID FRAME

IF it's a HUBER Road Roller, you needn't look any further for it's the most ruggedly built, most economical road roller ever designed. Built by the pioneer manufacturers of Motor Rollers, Huber offers Road Contractors, State and County Highway Officials and all others connected with the building and maintaining of highways the greatest machine of its type. You'll like its many features designed to speed up your work and do a better job. You'll like its reasonable first cost and better still, its low operating and maintenance costs. In short, upon investigation, you'll see that the Huber is all we claim for it—and more. A post card will bring you a copy of our catalog describing the 5 TON, 6 TON, 7 TON, 8 TON and 10 TON Hubers.

Write for Descriptive Catalog

THE HUBER MANUFACTURING CO., MARION, OHIO

Manufacturers of HUBER *Road Rollers and* SUPERIOR *Motor Graders*

$100,000,000 For Roads Creates Other Business

That it is good business sense to spend $100,000,000 a year on the roads of the United States is shown conclusively in a study of highway-construction expenditures made by the U. S. Bureau of Public Roads. The report prepared by C. F. Rogers, R. E. Hertel and R. W. Kruser presents in detail the effects of a continuing program of highway construction as an aid to Federal and state officials in determining a highway policy.

An annual highway expenditure of $100,000,000 results in an average annual employment on highway work and in industry of approximately 102,690 persons, continuously employed for twelve months at an average annual cost of approximately $970 per person employed. For each of the 37,960 persons employed directly on highway construction projects, approximately 1.71 names of individuals appear on project pay rolls and approximately 1.7 persons are employed indirectly in industries furnishing materials, equipment, supplies, and services.

The average direct worker continuously employed actually obtains 25.8 hours of work per week at 48 cents per hour. The average indirect worker obtains 38 hours of work per week at 59 cents per hour. The average annual wage is $640 for job labor and $1,170 for industrial labor. Highway-construction employment is furnished in rural areas and in urban areas in the same general proportions in which unemployment exists in these areas.

A variety of highway types, on which the relative amounts of direct and indirect labor vary, contribute to the feasibility of adapting employment in rural and urban areas in proportion to unemployment in those areas.

An annual highway expenditure of $100,000,000 initiates a movement which eventually involves, in the handling and processing of materials by industry, a total value of business transacted of approximately $315,000,000.

In addition to affording economic and unemployment relief, highway construction eventually provides a connected highway system which is a distinct national asset, promoting agricultural and industrial expansion and fostering social values.

Highway expenditures are providing a connected highway system composed of various road types and containing a variety of materials. The raw materials used in highway construction have widespread occurrence in nature. The adaptation of these natural resources to highway use requires numerous stages of processing. Stone must be quarried, transported, crushed, separated into sizes and proportioned with other materials in correct amount. Clay must be dug and converted into brick and tile. Limestone and gypsum must be quarried and manufactured into cement and plaster. Petroleum must be produced and refined into fuels and asphalts. Iron ore must be mined and shipped, and blast furnaces and steel mills must operate to produce structural and reinforcing steel. Cotton must be grown, ginned, and woven into fabric for tires and containers. Coal must be mined, and timber felled and milled. Finally, these materials must be concentrated in various proportions at numerous sites of construction and, after the application of a high degree of mechanization in the direct construction operation, they emerge in the finished highway.

Throughout this succession of processing stages use is made of tremendous resources in the form of plant and equipment, which, in a continuous program of highway construction, undergo steady depreciation and require maintenance, repair, and replacement of buildings, machinery and tools on account of wear and tear and obsolescence.

These requirements of highway construction cause business transactions in addition to the highway business transacted on the job. Each order for highway materials initiates the transaction of business in numerous places and in many industries. An order for steel requires the application of labor and equipment to materials purchased by steel mills from blast-furnace operators and other sources. Pig-iron manufacture causes the transaction of business in the conversion of iron ore, requiring the application of additional labor to plant and equipment. The transportation of iron ore from the mines adds to the value of business already transacted. Finally, the mining of iron ore further increases the value of business transacted. Each successive stage in the processing of materials represents the distribution of expense to labor, equipment, materials, and other expense, which items compose the cost of doing business. The total value of business thus transacted is the sum of the separate values involved in the several stages required for the complete processing of materials.

Sound management directs the application of labor in the processing of materials, and makes efficient use of every available mechanical means. Only by this combination is full value received for highway expenditures. A high degree of mechanical efficiency is an important adjunct of the agencies of production and distribution. Sacrifice of mechanical efficiency means higher cost, decreased volume of production, and ultimate reduction in pay rolls. Conversely, the use of efficient machinery and methods in construction mean lowered costs, increased productivity, and ultimate increase in pay rolls and the greatest return for funds expended.

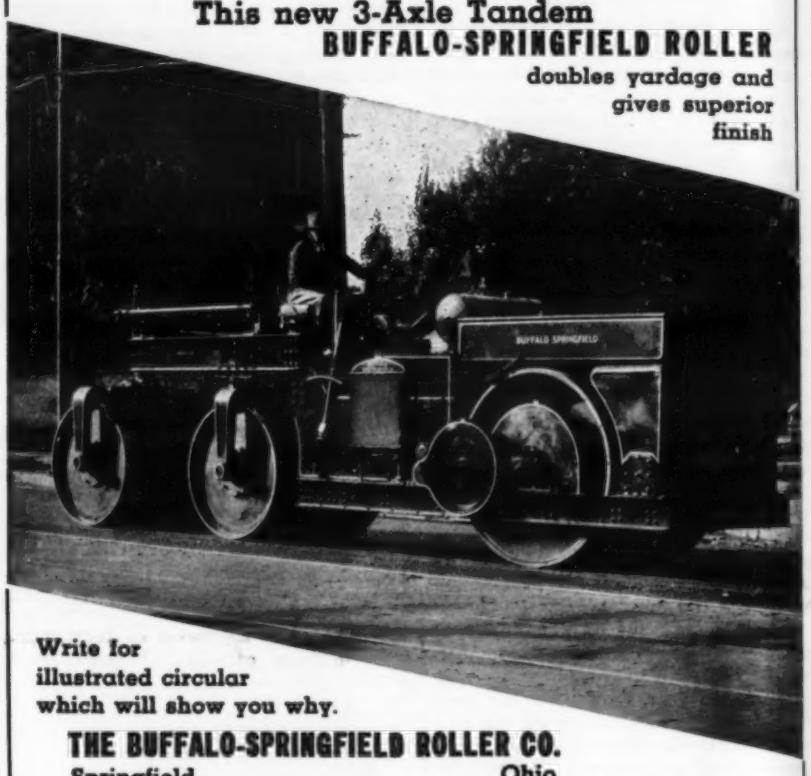
Portable Power Pipe Cutter Built for Contractors' Use

A portable pipe machine that is being used by some of the biggest contractors in the country because it is able to handle so many jobs is manufactured by Beaver Pipe Tools, Inc., Warren, Ohio. This Model-A Special pipe machine will cut, thread, ream and chamfer all sizes of pipe from ⅛ to 2-inch; it will operate geared tools to cut and thread 2½ to 12-inch pipe; it will cut off ¼ to 1-inch solid round bars or stayrods and thread bolts and stayrods from ¼ to 2-inch.

The wheel and roller cut-off feeds manually by a large star wheel on front of the machine and the swinging cone-type reamer instantly removes all trace of the burr. The machine may be equipped with a universal diehead in which the dies are changed or the self-contained dieheads in which the dies are not changed. The latter are used for production work where pipe is being threaded all day long in a variety of sizes and it is a matter of considerable economy in labor costs to use self-contained dieheads. One diehead is taken out and the desired size inserted, there being no small parts to get lost or mislaid. Each diehead cuts two sizes of pipe, except the ⅛-inch, and each diehead is marked with a distinguishing color band.

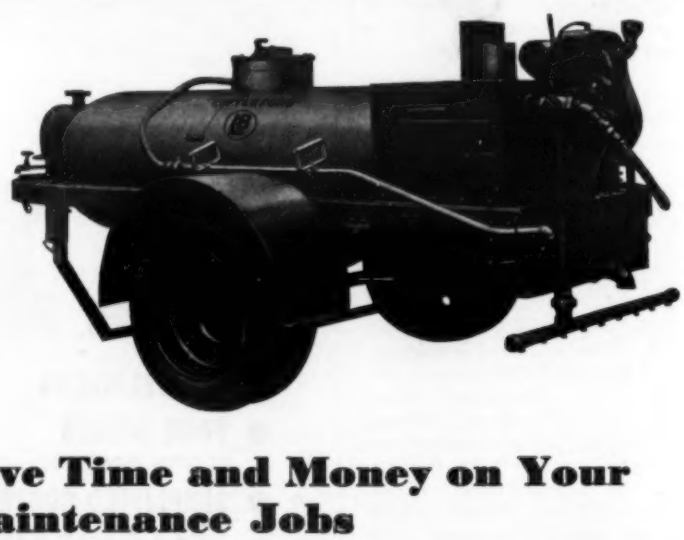
These pipe cutters are powered with a heavy-duty Universal motor operating from any 110-volt line AC or DC, 25 to 60 cycles, and have many other features appreciated by job mechanics.

This new 3-Axle Tandem
BUFFALO-SPRINGFIELD ROLLER
doubles yardage and gives superior finish



Write for illustrated circular which will show you why.

THE BUFFALO-SPRINGFIELD ROLLER CO.
Springfield, Ohio.



Save Time and Money on Your Maintenance Jobs

Use the Littleford No. 101 Utility Sprayer on shoulder redressing, curve widening or on large resurfacing jobs such as mix-in-place work. Benefit by a saving on bulk material as well as time on these jobs.

No. 101 Utility Sprayer is built in 300 to 1200 gallon capacity sizes. It has an air cooled motor, 50 gallon pump and a heating system using two burners with return type heat flues. Handles tar, asphalt, emulsion, cut-back or road oil.

Send for prices and literature on No. 101.

LITTLEFORD
Road Maintenance Equipment
SINCE 1900
LITTLEFORD BROS. 485 E. PEARL ST. CINCINNATI, O.

PORTABLE ASPHALT PLANTS
TOWER TYPE
LARGE CAPACITIES
HOT OR COLD MIX
Accurate control of materials to comply with any standard specifications for bituminous mixtures.
Send for Bulletin T-248
HETHERINGTON AND BERNER INC
Indianapolis, Indiana

The New Crushing and Screening Plant

A Portable Stone Plant With Radical Features

A radical departure from conventional design is found in the new portable crushing and screening plant offered by Diamond Iron Works, Inc., Minneapolis, Minn. This plant is unique in not using a bucket elevator and it does not have the exceedingly long wheel base ordinarily required when conveyors only are used for returning the material to the screen to complete the closed circuit. This Diamond plant, without the bucket elevator, is very little longer than the previous model using this method of returning the crushed rock to the screen. A Rotor-Lift is used, consisting of a rubber-lined, bowl shaped device with a hole in the center and set on the correct angle in the plant. The material from both the roll and the jaw crusher is conveyed to the bottom part of the lift and the rotation raises the material to an upper conveyor for return to the screen.

This new No. 75 plant has a 10-inch x 36-inch roller bearing jaw crusher for primary reduction and a 30-inch diameter x 20-inch face roll crusher for secondary crushing. A positive vibrator screen which is counterbalanced and set in live rubber to eliminate the transmission of vibration to the frame of the plant is used. Either ball or roller bearings have entirely replaced the old babbitt construction.

As standard equipment, an excess sand eliminator is also supplied for use in pits where a certain amount of sand must be wasted from the final product. This plant is entirely of electrically arc-welded construction providing permanent rigidity throughout the life of the machine. Pneumatic tire equipment is supplied for rapid transportation and three-point suspension is employed to prevent straining the machine during transportation over uneven roads.

Caterpillar Establishes a Permanent Road Show

Immediately following the A.R.B.A. Road Show in January, several large delegations of state highway officials, county commissioners and contractors headed for the Machinery Show at Peoria, Ill., where a half million dollars' worth of tractors and road machinery has been placed on display by Caterpillar Tractor Co. This Peoria exhibit will be a permanent one but in spite of this fact, more than 1,500 visitors attended the event during the opening week.

The exhibit is housed in the company's vaulted display room covering almost 40,000 square feet of floor space, and which includes a large theater where talking motion pictures are continuously shown during exhibit hours.

The company invited its distributors to bring groups of highway officials to the Show. In response, during the first week, delegations from North and South Dakota, Arkansas, Nebraska, Kansas and Minnesota arrived in special trains. Each group was entertained with a banquet at a leading hotel, and was shown through the factory and foundry. Luncheon was served in the display room. The larger groups were divided into sections, and each of these was assigned hosts and guides.

On display is the new diesel tractor line, diesel and gas-powered Auto Patrols and a wide variety of earth-moving equipment.

Why Do We Roll Roads?

There are but two functions of pavement rolling: one is to secure stability, incidentally reducing the voids and consequently increasing pavement density; the other, to produce a smooth-riding surface. Around these two roller functions the various rolling requirements of specifications are being written. Note the word "incidentally" above as used by H. S. Perry, Assistant Chief Engineer, Bureau of Maintenance, Ohio Highway Department, in discussing this subject. He believes it is used correctly, not to indicate that density is in the least not important, but to lay the emphasis where it unquestionably belongs.

In late years there has been so much emphasis placed on density alone, that some of the major factors involving pavement stability have not been receiving their proper emphasis and specification attention. Density is the natural result of stability, and the word itself implies the absence of certain voids. Rolling of un-bitumenized aggregate might be carried to a point where a maximum of density would result, and a pavement obtained that would rely practically on interlocking stability alone, with the presumption of early failure; or the aggregate might be bituminized with asphalts or tars of varying qualities, and yet a pavement be constructed of uniform high density, but of quite varying stability. Mr. Perry infers that the quality of bituminous binder is extremely important, and that it has been discounted in recent years, much to the detriment of the pavement.

In a paper before the American Road Builders' Association, he points that it is of little avail that the roller give adequate density and provide interlocking stability of aggregate by forcing it into positions of relatively maximum inertia, without also having provided the fundamentally important adhesive bituminous stability that will durably bond rock and bitumen.

There is another detail conducive of a smooth riding surface, the omission of which should not be tolerated on any job. This is the uniform distribution of mixed materials in advance of any rolling. Regardless of type, good horse-sense should require that this operation be painstakingly done. No roller can function properly otherwise, inasmuch as the roller was not designed to serve as a spreading machine. Rolling should be done from side to center, paralleling the center line; and the steering roll should always be in the rear on the two-axle roller when in operation.

Scraper Carries Big Loads

A 24-yard Carryall scraper for use with large-size tractors is now being manufactured by R. G. LeTourneau, Inc., Peoria, Ill., and Stockton, Calif. This scraper is a telescopic unit with a capacity of 24 yards loose measure. The body proper consists of five buckets, one within the other. As the buckets fill, they are pulled back from the cutting edge by one line from a LeTourneau four-drum power control unit until they form one long, evenly-filled bucket. By this scheme dirt is always loaded into an empty bowl with no tractor power being expended for pushing material up through dead earth.

The manufacturer claims that this 24-yard scraper loads as easily as 10 and 12-yard units and it dumps and spreads with ease and accuracy. Tires for the new unit are 18.00 x 24, mounted in four dual sets.

LANSING 10-S

There's more to Mixers-

than just mixing. LANSING, any way, has easy 1-man control, snappy response, strength, stability and continuous output. Hyatt roller bearings, rubber-tired wheels, 12 hp LeRoi engine. See a modern Lansing 10-S in action! Get complete data on this famous Mixer. Write, wire.

LANSING COMPANY
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BLAW-KNOX ROAD BUILDING EQUIPMENT

New developments and improvements in Blaw-Knox Construction Equipment are right in step with today's program.

With a background of years of practical experience, Blaw-Knox equipment is trustworthy. It is economical and low in maintenance. Designed to stand up under severe operating conditions, it is fitted to the job by skilled engineers. It helps immeasurably to fulfill contracts speedily and profitably.

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BLAW-KNOX ROAD BUILDING EQUIPMENT includes: BATCHERPLANTS
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GET Heil recommendations before you buy hydraulic dump units . . . The Heil line includes: slant type hoists, twin-cylinder hoists, telescopic hoists, hi-lift hoists and all types of dump bodies for all kinds of dumping service . . . Remember Heil equipment is guaranteed by one of the world's largest manufacturers of special equipment . . . See your nearest Heil distributor or write for free literature, address: The Heil Co., 3000 W. Montana Street, Milwaukee.

Air Hose by the Mile. Equipment Requirements Run Into Big Figures at Bonneville Dam. Above is Shown a Small Portion of the 5 Miles of Goodrich Air Hose Required to Keep Over 50 Pneumatic Drills Working on 24-Hour Schedules.

Public Protests Diversion of Gas Tax Funds

States that have engaged in diversion of highway revenues to purposes unrelated to highway construction are being called sharply to task by the motoring public from which these revenues are collected, according to reports made to the American Road Builders' Association by state and county officials in many sections of the country.

The "anti-diversion" provision which was written into the Hayden-Cartwright Act of 1934 served to check the tendency toward raiding highway revenues for a multiplicity of purposes, but the campaign to bring a total end to diversion of these funds was given renewed impetus at the A.R.B.A. Convention in Cleveland.

The Hayden-Cartwright Act provided that "Federal Aid for highway construction shall be extended only to those states that use at least the amounts now provided by law for such purposes in each state from state motor vehicle registration fees, licenses, gasoline taxes, and other special taxes on motor-vehicle owners and operators of all kinds" for highway purposes, except that no state shall receive less than two-thirds of what it otherwise would receive in Federal Funds. The effect of this provision was to peg diversion of highway funds at the mark existing when the law became effective.

This left the states that were diverting portions of their highway revenues to other purposes free to continue such diversion at the level then prevailing. It is now apparent that the motoring public is resentful that the guilty states are continuing to divert portions of their highway revenues and a nation-wide revolt has developed from spontaneous sentiment existing among all who are being "short changed" on their highway revenues, according to the American Road Builders' Association.

There is abundant evidence to prove that a considerable portion of the highway accident toll is due to this diversion. Many roads that are unsafe because of lack of improvement to meet modern traffic conditions could be made safe if all the money collected from gasoline taxes and motor vehicle licenses were used for road construction and maintenance.

The measure of justification of new roads is no longer the difference in operation costs between the improved and unimproved road measured in volume of traffic, but rather—will there be a corresponding state highway income from the gasoline tax?—Prof. W. S. Downs, West Virginia University.

Urge Federal Aid for Road

At the seventeenth annual convention of the Associated General Contractors of America in Miami in January, that organization passed the following resolution, urging the continuation of a regular plan of Federal Aid for highways of not less than four years.

WHEREAS, the ever increasing use of highways as a means of transportation necessitates the extension of highway facilities and the modernization of existing highways; and

WHEREAS, the Federal Government has for many years extended aid to the States in the development and improvement of highways; and

WHEREAS, the maintenance of construction programs on an even keel and the avoidance of delays in undertaking such programs may be accomplished only by adequate advance planning based upon a definite knowledge of future availability of funds; and

WHEREAS, the Bureau of Public Roads as a most efficient Governmental agency directing the improvement of highways by the States insures the economic expenditure of such funds as may be appropriated, thus serving the two-fold purpose of sound investment and unemployment relief;

NOW, THEREFORE BE IT RESOLVED, that the Associated General Contractors of America assembled in annual meeting at Miami, Florida, January 15, 1936, petition the President of the United States and the second session of the Seventy-Fourth Congress of the United States to provide authorization for the unbroken continuance of regular Federal Aid to the States for highway construction for a period of not less than four years in amounts of not less than one hundred twenty-five million dollars for each fiscal year, together with adequate authorization for each fiscal year for forest highways, roads and trails, roads through public lands and other Federal reservations, roads in national parks, and Indian reservation roads, in order that proper plans may be matured for the prompt, efficient, and economical usage of such funds.

The specific taxation of motorists has become tremendously important in the entire scheme of our national economy, because they inevitably affect not only the motorists but also all industries connected with highway use and construction, upon which 15,000,000 Americans depend for their livelihood.—Roy F. Britton, Director, National Highway Users Association.

Gowing Made Hobart Dealer for Southern California

Hobart Bros. Co., Troy, Ohio, has announced the appointment of the J. C. Gowing Welding Equipment & Supply Co., Huntington Park, Calif., as exclusive distributor for Hobart electric arc welders in southern California. Jim Gowing, Manager, is well known in the welding industry in California.

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LONG RANGE MACHINES

for Digging in the Dry or Under Water

Reach as far as 1500 ft.

Dig Deep; Dump High.

Capacities from 100 to 5,000 cu. yd. a day.

Low in Cost

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DIRECT LIFT HYDRAULIC TWIN CYLINDER

BULLDOZERS

Do what hundreds of prominent construction companies are doing on the big projects. Use the Bulldozer with direct lift. It operates without gears, levers, cranks or springs. Save repair bills on your tractor or bulldozer. Get instant, accurate blade control.

Ask for Bulletin on
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Also Road Rooters, Scrapers, Road Discs and Snow Plows.

THE BAKER MFG. CO.,
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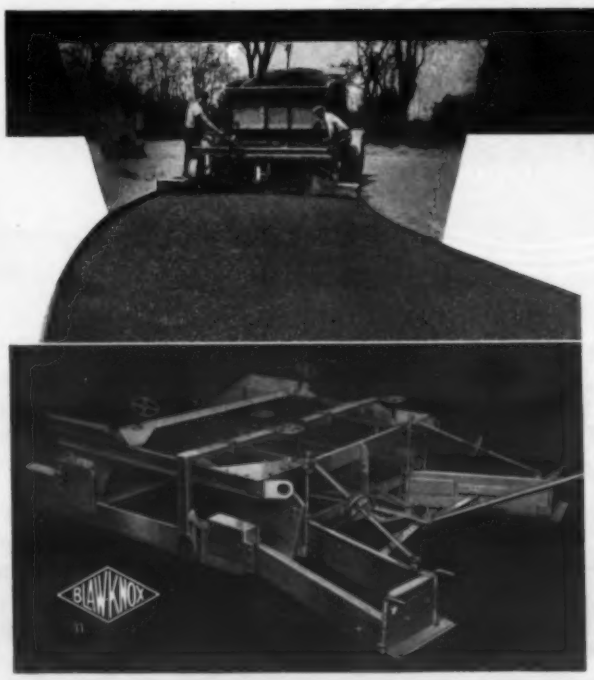

THE Blaw-Knox ROAD FINISH-SPREADER will spread and finish stone or gravel; hot or cold asphalt—one to fifteen feet wide—half a road at a time. Will lay varying widths on curves fully or partially banked—*with one machine at a fraction of the usual cost.*

Ask Blaw-Knox to send you Catalog No. 1523—"The Blaw-Knox Road Finish-Spreader.

BLAW-KNOX *Road* FINISH SPREADER

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2067 FARMERS BANK BLDG., PITTSBURGH, PA.
Offices and Representatives in Principal Cities

Steel Shapes Used in Dam Construction

Steel frame dams have been totally neglected for more than thirty years, according to Dr. Otis E. Hovey, Consulting Engineer of New York, in speaking before a joint meeting of the Engineering Societies of Washington, D. C. in February. In spite of this neglect there are in existence in the United States two such dams which have given service for more than thirty years and are still in excellent condition. One is the Ash Fork steel dam, in Arizona. "This dam," Dr. Hovey states, "was built in 1898. It has been painted at intervals of about seven to nine years, and was reported to be in excellent condition in 1935. There has been practically no damage from corrosion. Another, the Nedridge steel dam in Michigan, was built in 1900 and is thirty-five years old. It was repainted during 1913 and has not been painted since. In spite of the fact that it has not been painted during the last twenty-two years, it is reported to be in good condition but now needs another coat of paint."

Safety, accuracy of load resistance measurements, constant inspection during all processes of manufacture and construction, and economy, are cited by Dr. Hovey as being among the factors in favor of the use of steel frame construction for permanent dams. Steel is made and rolled at the mills and fabricated at the shops under full control. There is no uncertainty concerning the uniform quality of the material or in its application in the structure. A steel frame dam can be designed so that its principal members resist the water pressure in the most direct manner and with no uncertainty as to their action. The loads on the foundations are definite. Consistent factors of safety against overturning and sliding can be maintained.

(Continued at top of next column)

"Steel dams are made water-tight," Dr. Hovey explained, "by the old process of riveting and calking, or by the application of the more modern method of fusion welding. These methods apply equally to steel frame dams or steel faced dams."

The El Vado dam on the Rio Grande Conservancy District was finished in 1915. It impounds 198,000 acre-feet of water, which is about one-half of the annual runoff. The steel face required the use of 1,244 tons of steel, has an area of about 5 acres, and 60,000 linear feet of fillet welding was done on the face plates and parapet. Asserting that steel frame dams are more economical to construct than other types, Dr. Hovey added, "Estimates were made of the cost of construction of a steel frame dam in place of a concrete dam, 165 feet long with a maximum height of 54 feet, which was constructed across the Saranac River in 1913. The estimated cost of the steel dam was found to be 29 per cent lower."

And Now Traction Treads For Single Pneumatic Tires

J & S traction treads for single pneumatic tires to give added traction in mud, sand, snow and ice, which are very similar in construction to the J & S traction treads for dual pneumatic tires, have recently been announced by the W. A. Riddell Co., Bucyrus, Ohio. These treads are so designed as to give maximum flexibility, are simple in construction and are very easily mounted.

The wearing shoes are of special alloy steel castings; links and pins are made of high carbon heat-treated steel; pins are large and easily removed by the simple method of removing but one keeper lock ring. An adjustable master link compensates for tire wear. The inside of the tread plate is a smooth surface curved to fit the contour of the tire. These treads are held against the tire with sufficient tension to prevent their chafing or slipping and the manufacturer states that they do not mar or injure the tire in any way but rather are found to preserve its life. The J & S traction treads can be furnished for all standard tire sizes.

DIESEL DRAGLINES

3 50-B Bucyrus Erie Diesel Draglines, 50-ft. boom, 10-ft. extension. Atlas engine, caterpillar mounting.

2 775 P & H Diesel Draglines, 50 ft. boom, Atlas engine, caterpillar mountings.

The above are part of the surplus construction equipment of the Middle Rio Grande Conservancy District. Wire or write for list of all equipment, which includes pumps, compressors, lighting plants, tractors, shovels, pile driving outfits, concrete mixers, scales, Insley concrete placing outfit, concrete heaters and vibrators, gravel screening plant, compressed air drill sharpeners, shop equipment, gasoline powered hoists with and without skips, bar benders and cutters, carbic floodlights, and other items at bargain prices.

R. L. HARRISON CO., INC.
ALBUQUERQUE, NEW MEXICO

Truck Shovel Unit Easily Convertible

The Michigan Model T6 truck shovel, features of which are the fingertip clutch control, modern design, mobility and versatility, is easily convertible to crane, dragline, clamshell, trench hoe, backfiller and skimmer.

The unit is powered by a Hercules Model JXC 6-cylinder motor of 57 horsepower at 1,800 rpm. For shovel operation the motor is governed at 1,350 rpm and for travel at 1,800 rpm. The road speeds are 3.42 mph in low gear up to 25 mph in fourth gear and 2.8 mph in reverse.

Both the rear and front wheels are equipped with Lockheed hydraulic brakes with a vacuum reservoir for safety. A mechanical emergency brake is installed on the drive shaft.

This truck shovel unit has a one-piece casting turntable with the side frames cast integral. A quick-acting positive lock accessible from the operator's seat makes it possible to lock the table quickly. The unit weighs 18,000 pounds as a shovel, and 16,900 pounds with a 25-foot crane boom. The basic machine, with standard counterweight, weighs 15,700 pounds.

The shovel boom is a cylindrical seamless steel tubing 10¾ inches in diameter and 15 feet 3 inches long from center to center. The crane boom is of lattice type construction and is furnished in lengths up to 40 feet with a jib extension if desired. The hoist line speeds are 180 feet per minute on single line, 90 feet per minute on 2-part line and 60 feet per minute on 3-part line. The single line pull is 7,420 pounds. The boom hoist is located on the main jack shaft and controlled by an air-operated friction disc. The clutch is also equipped with a safety pawl and powerful brake for safe boom control at all times. This shovel is made by the Michigan Power Shovel Co., Benton Harbor, Mich.

Williamsport Wire Rope *Built to suit your individual needs*

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Here's a construction we recommend for work of this character. It is the result of years of scientific engineering development.

We have found more and more the great advantage of building ropes to suit each individual need or operation.

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WILLIAMSPORT, PENNA. Other Offices in All Principal Cities 122 S. MICHIGAN AVE., CHICAGO

Sinking Caissons for Quabbin Dam

(Continued from page 22)

feeder. The first circular screen took out all material over 2-inch screen size which went to the 14 x 28 New England jaw crusher. All other material and the crusher-run went to an 18-inch belt 145 feet long which delivered it to a shaker screen at the top of the plant which was operated by a Hercules engine. The shaker screen again removed all material over 2-inch and also the sand. The remaining sizes were delivered to the washer and then direct to the Erie batching plant beneath the washing and screening unit.

Concrete Handling

A fleet of seven batch-trucks hauled the wet weighed aggregate from the Erie plant a distance of about ¾-mile to the Butler cement batching plant. Cement was received in LCL containers, 10 or 12 to a car, which were unloaded by a Speedcrane using a specially rigged tackle and emptied into the hopper of the cement batching plant set up alongside the track.

Each batch truck was so constructed that the floor of the body sloped to the back, the total rise from back to front being about 6 inches. The metal floor was perforated at the tail gate to drain the aggregate as the truck traveled from the aggregate batchers to the cement batchers and then to the concrete mixer.

A Ransome double drum paver was used for mixing all of the concrete. The batch trucks dumped their 0.95-yard batches into the skip. These were converted into concrete by a ¾-minute mix in each drum of the paver. The mixed concrete was delivered to the ground hopper of a Barber-Greene crawler conveyor with a 40-foot boom and 24-inch belt.

The belt conveyor delivered the concrete to a hopper at the top of an elephant-trunk chute. A gang of five or six men puddled the concrete by treading it and, when the concrete was dry, used a Jackson vibrator to remove any air from the concrete. This vibrator was operated by a Lauson gas engine mounted on the crawler bed of the electrically driven B-G conveyor, a distance of about 60 feet from the vibrator itself. Concreting was carried on continuously as required, using three 8-hour shifts.

Dimensions and Quantities

The dimensions of the main dam are expected to be as follows:

Height above lowest ledge	295 feet
Maximum height above valley	170 feet
Maximum depth of water	150 feet
Length of dam	2,640 feet
Volume of dam above original ground surface	4,000,000 cubic yards

Principal Quantities and Unit Prices for the Core Wall

Item	Quantity	Unit Price
Earth excavation	230,000 cubic yards	$0.65
Rock as boulders	7,000 cubic yards	0.65
Rock as ledge	6,000 cubic yards	7.50
Stripping of foundation area	60,000 cubic yards	0.65
Unconsolidated embankment	40,000 cubic yards	0.05
Consolidated pervious embankment	190,000 cubic yards	0.05
Rolled impervious embankment in core	90,000 cubic yards	0.60
Rolled impervious embankment outside of core	40,000 cubic yards	0.60
Stone fill	65,000 cubic yards	1.00
Earth excavation in caissons	40,000 cubic yards	7.00
Rock excavation in caissons	4,000 cubic yards	11.00
Rock excavation outside of caisson in core trench	300 cubic yards	10.00
Concrete	50,000 cubic yards	6.00
Concrete placed under air	7,000 cubic yards	6.00
Impervious fill in caissons	5,000 cubic yards	1.00
Impervious fill outside of caissons in core wall	300 cubic yards	1.00
Drilling grout holes in rock	12,000 feet	0.80
Furnishing and placing grout	1,000 cubic yards	11.00
Portland cement	90,000 barrels	2.20
Pumping ground water	300,000 million ft. gals.	0.10 (fixed price)

Personnel

The Swift River project of the Metropolitan District Water Supply Commission is being constructed under the direction of Frank E. Winsor, Chief Engineer. The contractor for this work was The Two Companies, Inc., of Boston, Mass. This contracting organization is composed of B. Perini & Sons, Inc., of Framingham, Mass., and C. J. Maney Co., Inc., of Boston, Mass., who pooled their interests and equipment. Open cut excavation and earth work was handled largely by the first of these two organizations with Edward Kelly as Superintendent for B. Perini & Sons, Inc. The caisson operations were done by A. R. Terwilliger, as Superintendent, and J. C. Drummond, Assistant Superintendent, for C. J. Maney Co. The officers of The Two Companies, Inc., are: President, Joseph Maney; Vice President, Louis R. Perini; and Treasurer, Joseph Perini. The contract allowed 19 months for the completion of this project. On November 1, the work was eight months ahead of schedule.

Day Labor vs. Contract

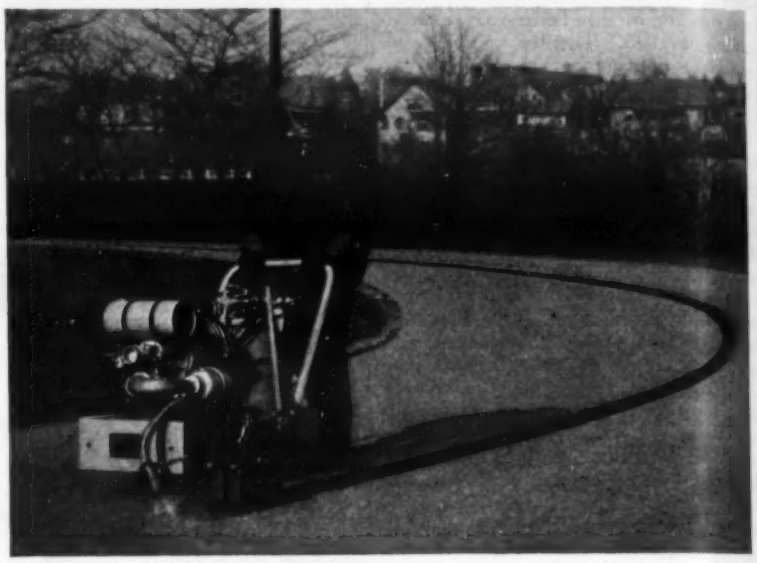
The economy of the contract system as compared with the day-labor method was recently definitely proved by the construction of the Ashland-Cannonsburg road in Boyd County, Ky., by the State Highway Commission, as evidenced by the final estimate figures recently released by the Commission. The construction of the project, consisting of 1.273 miles of grading, drainage and surfacing, by the day-labor system, was carried on by the Division of Maintenance under the general direction of the U. S. Bureau of Public Roads as part of a nation-wide test for comparison of the relative economies of the day-labor and contract systems.

This job was financed by the Federal government and no doubt is the fairest and most accurate comparison of performing such work ever undertaken in Kentucky, as it was required by the Bureau of Public Roads that bids be first received and then the State undertake to perform the work called for in the proposals at the figure submitted by the low bidder. Accurate costs were kept and employment conditions were observed by the State as if the work were being done by the contractor who submitted the low bid.

No advance information was given about the State's intention to use this project as a test case until after the bids were opened. The traffic-bound slag surface for which this project called is perhaps the simplest surfacing that can be done. The low bid on the job was $41,109.65 but the final contract cost according to the units of work completed would have been $39,272.57. The actual cost by the day-labor method, as reported to the Bureau of Public Roads, was $44,180.24 which amount does not include $1,014.50 paid out in gasoline tax which the Bureau will not refund.

According to the proposal, the low bidder would have been required to complete the project within 130 calendar days or pay liquidated damages at the rate of $30.00 a day. The time actually required to complete this job by the day-labor method was 264 calendar days. Had this happened under the contract system, the contractor would have been assessed by the State at the rate of $30.00 a day or a total of $4,020.

As is pointed out in a recent issue of *The Scraper*, had this work been done by contract, the Highway Commission would have known in advance what the project would cost and the contractor would have been held responsible for the quality of his work and would have been made to remove and replace any defective work at his own expense. Further, the contractor would have been required to furnish bond not only assuring the quality of his work but also the completion of the work at a definite date. The inconvenience to the traveling public being denied the use of the completed road for a period of 134 calendar days can not be figured in dollars and cents.



THE LITTLEFORD TRAF-O-SPRAY

Traffic lines spray painted by the Traf-O-Spray are neat, uniform, penetrating. No hand retouching is necessary on any hard surface—rough or smooth. The hand gun is quickly removable for any other spraying or painting operation you might have. Machine is precision built yet light, short coupled—easy to handle. Write for prices and bulletin L-9.

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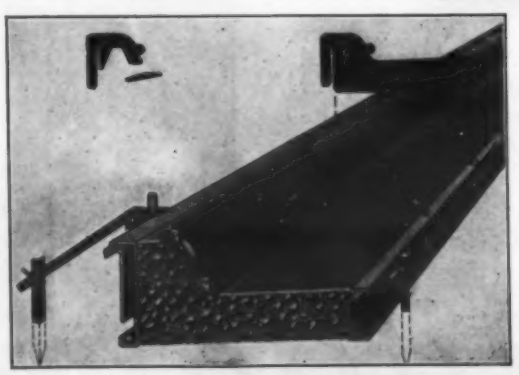
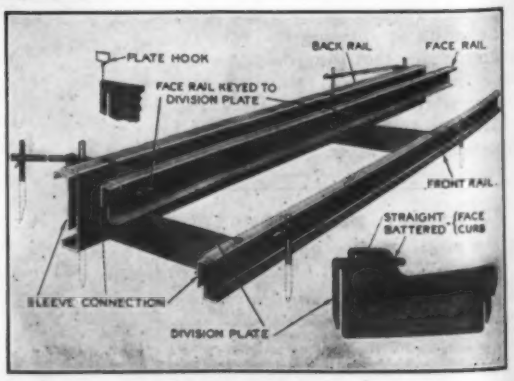
Traffic Line Marker
TRAF-(LB)-SPRAY
LITTLEFORD BROS. 485 E. PEARL ST. CINCINNATI, O.

HELTZEL STEEL FORMS

● Illustration below shows Curb-and-Gutter form with double radius face form. Insert shows skeleton face-rail support. Each rail is securely locked in place, being keyed to the stakes. The division plates support front and back rails their full depth, and can be removed without disturbing concrete or side rails.

● Illustration below shows complete 10 ft. section Heltzel Utility Forms for combined Curb and Gutter construction. Contractors will find Heltzel Utility Forms adaptable to all types of concrete street work—Sidewalk, Curb, Combined Curb and Gutter and Integral Curb-and-Base.





Write for Bulletin 200

THE HELTZEL STEEL FORM & IRON COMPANY
WARREN, OHIO · U. S. A.

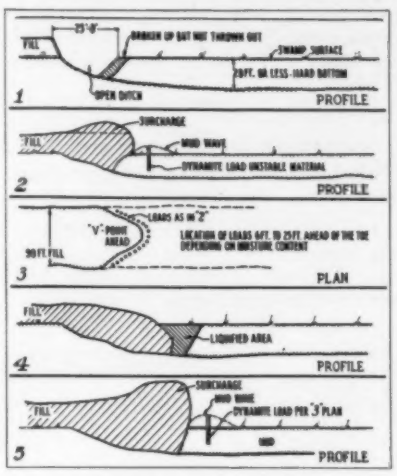
Write for Bulletin 200

The Toe Shooting Method Latest for Settling Fills

The toe shooting method of settling fills is applicable where a road is built over a new right-of-way, and where the muck is 20 feet deep or less. If there is a heavy mat of roots this should be broken up with a minimum of explosives by propagation ditch shooting.

As soon as the fill reaches the edge of the swamp an open ditch is shot for the width of the road and to a depth of 4 to 6 feet. The fill is carried forward into this open ditch until a sizeable mud wave is pushed up. Then a surcharge of fill is added while charges of dynamite are placed around the V point of the fill 6 to 25 feet ahead of the toe, depending upon the moisture content. These are fired and settlement is obtained and the operation repeated. Ditching dynamite is used, and the holes are fired by propagation. The holes are placed from 3 to 6 feet apart, and are usually loaded with 1 pound per foot of muck.

The advantages of this method are that shooting never holds up the contractor, that holes are easily and quickly made, that each blast not only drops the surcharge into place but compacts the fill already in place, and that settlement can be watched more closely and the load varied to meet conditions as they arise. Inasmuch as every fill has individual characteristics, it is recommended that the engineer make complete soundings, developing a sub-surface profile, and then call for assistance from a competent explosive engineer. All specifications should carry a clause to the effect that trial shots, followed by soundings, must be made before a definite loading program be developed for an individual job.



The Toe Shooting Method

A Powered Dump Wagon For Hauling Pay Loads

A 7-yard dump wagon which can make 20 miles per hour under its own power for fast road travel, has a short turning radius at the dump and loading point, and other interesting features has been announced by the Koehring Co., 3026 W. Concordia Ave., Milwaukee, Wis. This Koehring Trail-Dump has a "non-raring" hitch attached to the four-wheel tractor ahead and below the drive axle so that the greater the pull the better the front wheels hug the grade. A box-type tongue is securely welded to the full height of the wagon front. An "automatic hand" controls the bottom dump door action simply. When the operator returns the dump lever to the original position, immediately after pulling off the load, the doors are closed automatically by a simple pawl and drum arrangement. The closing operation stops at once after the doors are closed or motion is stopped by stones.

The body is made of a single plate welded for strength and rigidity and to prevent distortion and weave on uneven grades and at the same time furnishing light weight to give a maximum pay-load ratio. The entire unit is 25 feet 7 inches long and 180½ inches wide. The tractor is powered with a 4-cylinder 1,800 rpm valve-in-head motor.

Cars and Construction

Men argue whether the hen or the egg came first; there will be no argument whether the improved road or the motor car came first. The car did. And, mark you, road building is construction work, intimately connected with house building, said W. J. Cameron, Vice President of Ford Motor Co., on a recent Ford Sunday Evening Hour. When roads improved for the motor car and pushed in all directions, young married people and growing families discovered that cheaper land for home sites could be had farther out. Three miles, five miles from town, prohibitive distances once, meant nothing—they had a car. Formerly impassable roads of spring and winter were no hindrance. The car had improved them. And so hundreds of thousands of new-built homes converted country fields into residence sections, and each section soon had its own business center—a building revival of immeasurable extent.

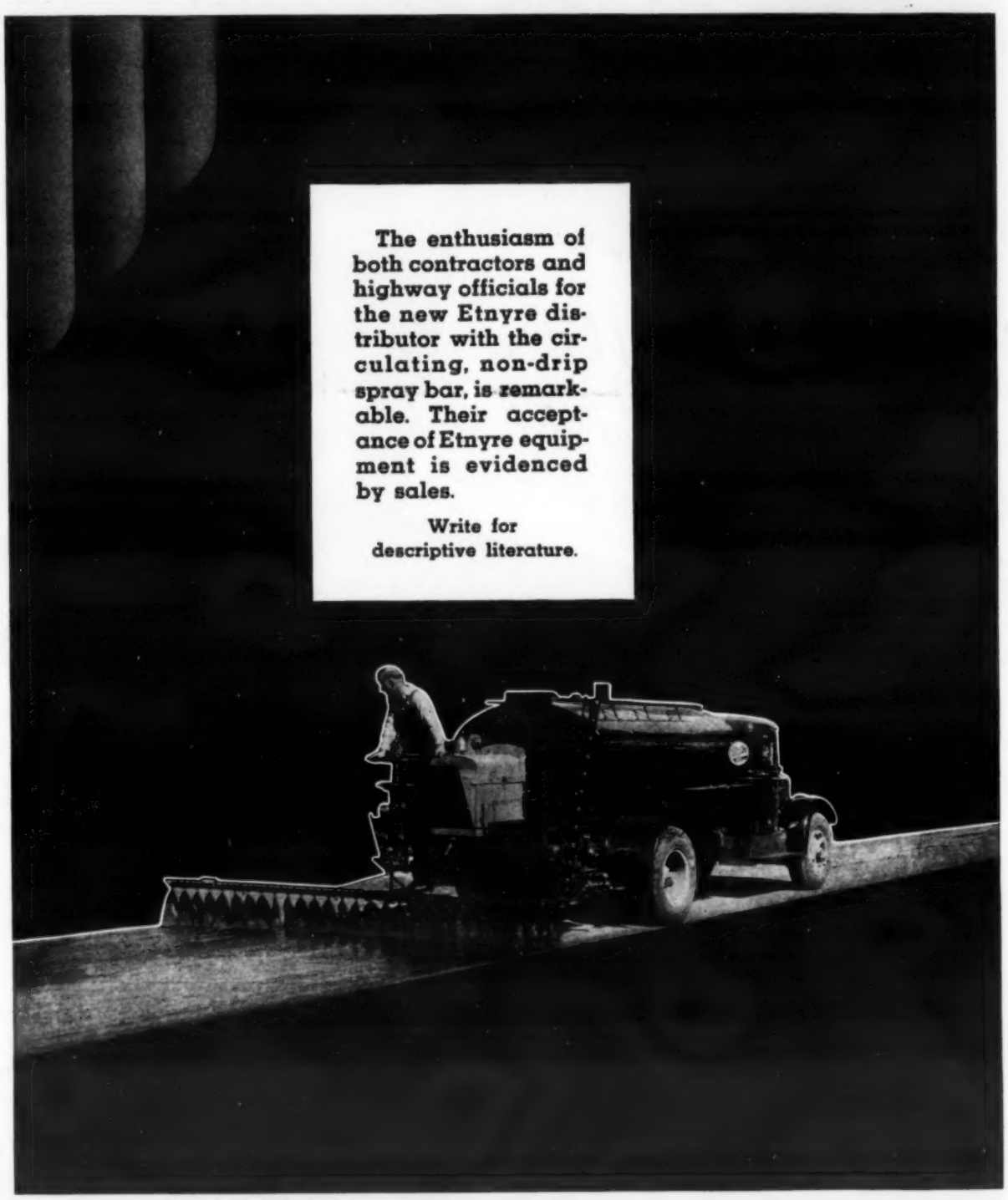
The motor vehicle did more than extend the building area. It affected building costs and methods. It hauled bigger loads of lumber, bricks and stone longer distances in less time at lower cost than horse teams. In excavation, the slow expensive wheelbarrow gave way to the swifter, cheaper self-dumping motor truck, which also allowed the economy of power shovels formerly used on big jobs only. And so the costs went down and the houses went up, out where the air was clear and the day and night were quiet. The part the motor car had in this is very vivid. It explains why Ford cars alone carry three times the number of passengers and twice the amount of freight of all the railways in the United States. It is home and family traffic over the longer local distances.

Feenaughty Appointed New Bay City Dealer

Bay City Shovels, Inc., Bay City, Mich., has announced the appointment of Feenaughty Machinery Co., Portland, Ore., with branches in Seattle and Spokane, Wash., and Boise, Idaho, as exclusive distributor for all sizes and models of Bay City shovels for the states of Washington, Oregon and Idaho.

HOISTS
FOR CONTRACTORS

● Profit with IDEAL HOISTS wherever there is a rope or cable to pull. Two sizes—1200 to 2000 pounds. Reversible and non-reversible—single or double drum with or without engine or motor. Write for details.
UNIVERSAL HOIST & MFG. CO.
606 E. 14th Street, Cedar Falls, Ia.


The enthusiasm of both contractors and highway officials for the new Etnyre distributor with the circulating, non-drip spray bar, is remarkable. Their acceptance of Etnyre equipment is evidenced by sales.
Write for descriptive literature.
E. D. ETNYRE & CO.
DEALERS IN ALL PRINCIPAL CITIES
400 JEFFERSON ST., OREGON, ILL.

Auto License Revenues Low Despite High Registration

Although the registration of motor vehicles in Minnesota reached a new all-time peak in 1935, license fee revenues were $4,000,000 lower than in 1930, according to a Highway Department bulletin. The year 1930 is the closest to 1935 in total number of automobiles registered.

In 1930 automobile owners paid $11,074,653 in license fees toward the upkeep and improvement of a 6,700-mile trunk highway system. In 1935, car owners paid $6,993,684 in license fees toward the upkeep and improvement of an 11,300-mile trunk system. Thus the payments dropped more than 36 per cent while the mileage increased 65 per cent, with a corresponding rise in expense.

The registration of cars in 1935 was 753,076 while in 1930 it was 744,271. The decrease in revenues is due to the reduction in license fees in 1933 which made a small saving to the individual car owner and a large drop in highway funds.

Courtesies to Engineers Extended by British Magazine

In order to aid visiting contractors and engineers who wish to get in touch with highway engineering firms and other interests in Great Britain and in the British dominions and colonies, Hugh Miller, Editor, *Highways and Bridges*, has extended an invitation to such visitors to call upon him at his office where he will be glad to assist them with entirely disinterested advice.

The advantages of such assistance to visitors to Great Britain who are interested in road and bridge construction and maintenance are obvious. The address of this publication is 256-257 Bank Chambers, 329 High Holborn, London, W. C. 1.

THIS ASPHALT PAVING CERTAINLY HAS STOOD-UP IT'S STANOLIND CUT-BACK, ISN'T IT?
YES, AND BESIDES, WE'VE HAD FEWER TRAFFIC ACCIDENTS BECAUSE OF ITS NON-SKID, NON-GLARE SURFACE.
ASPHALT PAVING . . has many EXTRA values!

PAVEMENT as modern as the vehicles that use it! That is what modern asphalt provides. Smooth, streamline pavement that enhances and prolongs the riding ease of the modern automobile. Non-glare surface—and particularly with Stanolind Cut-Back Asphalt, a non-skid surface—that makes driving safer.

Add to these qualities the long life, the low first cost and the low maintenance cost and you have the explanation of the wide popularity of modern asphalt pavement among public officials and taxpayers.

No matter what your requirements may be, there's a type of Stanolind Asphalt to fit the job exactly and economically. And Standard's representatives will be glad to lend the help of their knowledge and experience in selecting the correct materials and methods for any particular job. Telephone your local Standard Oil (Indiana) office, or write.

When you pave with asphalt the investment in materials and equipment is relatively small and the distribution of labor greater.

Copr. 1936, Standard Oil Co.

ASPHALT goes farther

STANDARD OIL COMPANY
910 S. MICHIGAN AVE. (Indiana) CHICAGO, ILL.

IN LONG-WEARING ROAD MILES . . . IN DISTRIBUTION OF LABOR . . . IN TAXPAYER SATISFACTION

Dirt-Moving Unit Digs, Carries, Dumps, Spreads

The Heil Dig-N-Carry scraper, which was exhibited by the Heil Co., 3000 W. Montana St., Milwaukee, Wis., at the Road Show in Cleveland, is a powerful heavy-duty dirt mover which digs, carries, dumps and spreads quickly and efficiently. According to the manufacturer, soil conditions have little or no effect on its operating efficiency as the features of its design make it possible to move hard, packed, loose, sandy or rocky soil.

The operation of this scraper is simple. A control lever operates the hydraulic hoists which force the cutting edge into the earth to the desired depth. As the scraper moves along, a ribbon of earth, loosened by the cutting edge teeth, rolls up and into the curved-bottom bowl. This rolling action continues until the bowl is filled to its 12-cubic yard capacity. The operator then reverses the control lever and the cutting edge is lifted out of the cut. At the same time a separate control lever closes the front apron to confine the load. The scraper moves on to the dump where the front apron is opened, the bowl lifted or lowered to the desired position and the load is discharged by the rear apron, also individually controlled.

Among the features of this unit are the large front apron opening, permitting loading boulders, clods, etc., and insuring a clean dump of sticky material; the removable teeth in the cutting edge; the forced digging by hydraulic power, bringing the entire weight of the scraper on the cutting edge as it digs; controls mounted on the scraper platform; the heat-treated steel ball and socket joint permitting the tractor to turn easily at right angles to the scraper; and the rigid all-welded steel frame supporting the scraper assembly. The frame entirely surrounds the main body of the scraper, permitting shovel loading so that the unit can also serve as a carry wagon.

Heil Dig-N-Carry scrapers are made in four sizes ranging from 6 to 12 cubic yards capacity.

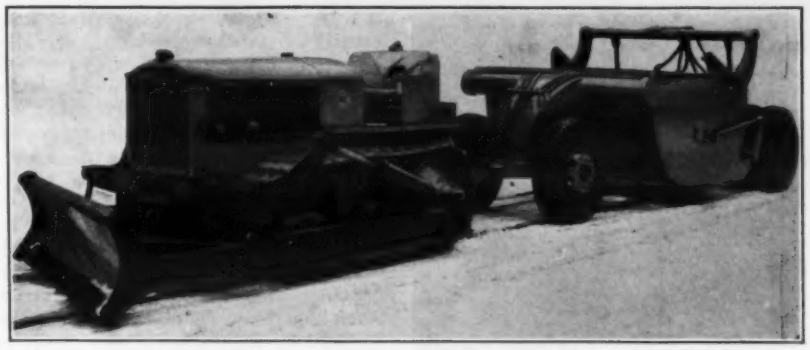
War Clouds over Egypt Spur Road Construction

For many years, the government-owned Egyptian State Railways has discouraged the growth of motor vehicle traffic since it might have an adverse effect on its earnings. However, with the outbreak of hostilities in Ethiopia and its attendant possibility that Egypt might be drawn into the conflict, the necessity of building modern motor roads for troop mobilization has suddenly come to the fore, according to a recent report from the Bureau of Foreign and Domestic Commerce.

All the various projects which have been hanging fire for years are being rushed to completion and the sums originally set aside for the construction and maintenance of motor roads have been greatly exceeded by additional allotments necessitated by the military situation.

The desert road connecting Cairo and Suez, hitherto impassable, is rapidly being macadamized. Another desert road to connect Cairo and Alexandria is also being rushed. The only highway connection between these two important cities at present is a dirt country road which leaves much to be desired. Perhaps the greatest efforts are being expended in the construction of a road along the Mediterranean to connect Alexandria with the Western Libyan border where thousands of Italian troops are massed.

The old adage about an "ill wind" seems to have some application here. It is to be hoped most sincerely that there will be no use for these roads for the purpose for which they are being rushed to completion but at least, out of the war scare, the country will have a much improved road system.



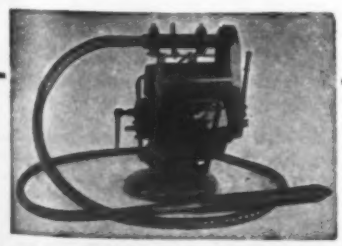
A Heil Dig-N-Carry Scraper Hauled by a A-C Model K Tractor

Plant-Mixed Material for Stabilized Roads

A new bulletin on plant mixing of calcium chloride stabilized soils and aggregates for low-cost roads has been issued by the Calcium Chloride Association, 4145 Penobscot Bldg., Detroit, Mich., for free distribution to all persons interested.

This Bulletin No. 24 covers the developments in plant mixing of stabilized material, needed equipment, preparation of the aggregate, preparation of binder soil, the addition of calcium chloride and water, the mixing apparatus and laying on the road.

Copies may be secured by interested contractors and engineers by writing direct to the above address and mentioning this magazine.



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P&H PACEMAKERS···FASTER IN THE FIELD

Texas Lake Drained By Pipe Siphon

Hydrogen Sulphide And Excess Stumps Had Made Sportsman's Paradise Unusable

WHEN the Spring Lake Country Club of Crockett, Texas, dammed Spring Creek a number of years ago to form a mile-long lake averaging 200 yards wide and 34 feet deep near the lower end, they saved money by not completely clearing the lake of trees. This resulted in projecting and floating trunks and branches which interfered seriously with boating and fishing. Also, the submerged wood caused a high concentration of hydrogen sulphide in the deeper water.

Early in 1935 it was decided to lower the lake surface about 25 feet and thus make it possible to clear away the stumps and tree trunks. The only outlet for the lake was a spillway 40 feet long at one end of the dam and a few feet lower than the crest. No culvert or sluiceway existed through the embankment itself.

In order not to disturb the dam, which was well consolidated and had withstood many floods, the most practical thing to do was to siphon the water over the embankment. For this purpose an Armco corrugated pipe siphon was installed. It consisted of a 24-inch diameter pipe of 10-gage material and of a total length of 172 feet. The pipe was close-riveted and soldered except for two field joints which, for purposes of assembly, were welded. The intake of the siphon was lowered into the lake just above the dam to a depth of approximately 25 feet. The installation required three days. The lake level was lowered 16 inches in 22 hours after the siphon was first started with a priming pump.

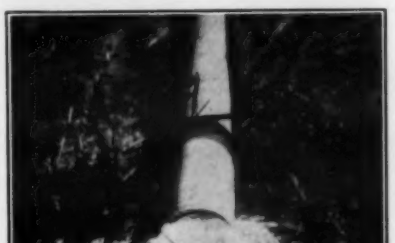
In April, after the siphon was operating and it was expected that the lake would be drained rapidly, heavy rains set in for a period of six weeks with the result that the capacity of the creek below the dam was overtaxed, flooding out some land. For this reason, the siphon was discontinued temporarily.

The siphoning was stopped and started several times by admitting air to the pipe or by exhausting the air with a double-action pump. It took only about 45 minutes to start the siphon flowing. A cap for the siphon outlet was made of a square of asphalt paving material 6 inches thick, making the lower end water and air-tight.

Cleaning Out the Lake

The lake is rather definitely divided into three sections. The upper end and the central section were drained almost completely. The lower section near the siphon was drawn down 16 feet from the original depth of 34 feet. The siphon stopped at this point because the inlet side had been resting on a dead tree and the water seal was broken.

The greatest number of trees was found in the two upper sections of the lake. The trees had not softened after having been in the water for seventeen years. They were sawed off and the debris piled and burned in the lake bed. This work was done in ten days by a crew of twenty-five men. In the two upper sections of the lake the trunks were cut off within 1 foot of the ground and in the lower section where the water



The Discharge End of the Siphon Running Full

still stood at a depth of 16 feet, it was possible to cut the trees low enough so that when the lake was again filled, there would be no obstructions.

It is interesting to know that seventeen years ago before the dam was built, part of this low land served as a cotton field. When the lake was drained, some of the cotton rows were still faintly visible and cotton stalks stood where they were when the lake was filled.

The lake banks have been neatly trimmed and when the lake is refilled, it is to be replenished with 100,000 fish from a nearby state hatchery. The Directors of the Club originally intended to sell the siphon after it had served its purpose but later decided to leave it as a permanent installation. The depth of the lake causes a concentration of stagnant water low in oxygen content in the deep portion, which creates a bad condition for fish. In the future this condition can be relieved by starting the siphon after heavy rains and letting the surplus water drain from the bottom of the lake rather than from the surface.

A Finished Subgrade Prepared at the Paver

A machine-tamped subgrade immediately behind the paver means a saving in concrete to the contractor and less worry on the part of the highway official concerning the accuracy of the grade. The R-B Equipment Mfg. Co., 720 E. New Hampshire Ave., Royal Oak, Mich., has developed a power Trailgrader which delivers a finished subgrade at the paver just before the concrete slab is poured. The forward cutting knives which operate at 400 rpm loosen up the surface, cutting a smooth grade and cross section. Surface-tamping members immediately behind the knives compact any loose remaining particles accurately to grade. Excess soil is carried along in front of the grader and is readily shoveled out of the way by a laborer.

The R-B power Trailgrader is either towed by the paver when the paver runs on the grade, or by a roller or tractor when the paver is off the grade. The Trailgrader furnishes its own power to operate the cutting knives and tampers so that it is not necessary to back up the equipment to take a second cut.

This Trailgrader is made in two sizes, 20 feet and 10 feet long. The 20-foot machine can be adjusted to a minimum of 18 feet and the 10-foot machine can be modified for use on 9-foot roads. All parts are made with a high safety factor with castings of first quality electric alloy steel. The 10-foot machine weighs 3,500 pounds and the 20-foot machine 6,500 pounds. Both are powered with Hercules IXB 3½ x 4 inch motors operating at 2,000 rpm.

The Directory of Distributors

appears every other month. The next insertion will be in the April issue. The previous listing of this directory was in the February number. *(See pages 40 to 43.)*

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New ease of handling. New speed in getting from job to job. Faster operation than ever developed in the one and two-bag mixer field.

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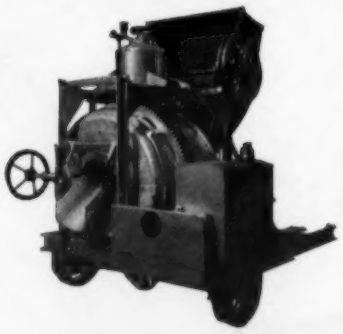

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Consider these features on No. 78-OB Kettle.

EFFICIENCY—double heat circulation permits 20% saving in time and fuel—high speed running gear.

PERFORMANCE—300 gallon capacity—warming hood for extra barrel—motor spray, controlled at spray handle.

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Light Trucks or Heavy Trucks? Each Has Its Service Niche

Reports Received Show That Light-Weight Units Predominate But Type of Work Must Determine Final Choice of Size

REPORTS coming from all sections of the country, from contractors owning anywhere from 1 to 45 trucks, furnish a fair sample of the sizes of trucks used by contractors. These contractors own on the average of 6 to 7 trucks each and in addition many of them hire trucks. This figure checks with estimates made in other years and indicates that there has been no serious decrease in the number of trucks owned by our contractor readers. On the basis of this study, these 12,000 contractors own 70,000 trucks and are going to own more.

Most of the trucks reported are equipped with pneumatic tires, solid tires having gone out in 1932. Of the 579 trucks purchased by 200 contractors since 1932, only one bought last year has solid tires. Of the 1,321 trucks purchased during the past 17 years, 1,158 have gear drive and 165 chain drive.

In point of numbers, the preference is distinctly in favor of light-duty trucks. The expressed experience of the first 100 contractors to report was 71 to 29 in favor of light trucks. The first 200 contractors sending in reports expressed themselves 131 for light-duty, 51 for heavy-duty and 18 for each type in its place.

1½-Ton the Favorite

The scene shown in Table 1 is easily dominated by the 1½-ton truck, its purchases amounting to 47 per cent of the total purchases since 1925. Its rise began in 1929 and reached predominance in 1931. Its ratio to total purchases during the past 7 years has been as follows:

	Per Cent		Per Cent
1929	14	1933	52
1930	18	1934	66
1931	34	1935	65
1932	41		

Two Typical Contractors

A general contractor of Stockton, Calif., prefers light-duty trucks. He owns 35, of which 14 of 2 to 5-ton rating were purchased between 1923 and 1927. During the last year he has bought five ½-ton trucks and fifteen 1½'s. The average mileage on all these trucks is about 15,000 per truck per year. It has taken him 12 years to get full mileage from any of them. Of significance are the loading ratios, only 32 per cent above the tonnage rating. Here are the facts he furnished on his truck fleet:

	Number	Ton Rating	Ton Load	Age Years	Truck Mileage	Per Year
Chevrolet dump	3	1½	2	1	20,000	20,000
Ford dump	12	1½	2	1	20,000	20,000
Ford pickup	5	½	—	1	20,000	20,000
Reo pickup	1	½	—	3	50,000	16,000
Autocar	3	5	6	3	50,000	16,000
Autocar	5	3	4	8	100,000	12,000
International	2	3	4	8	100,000	12,000
Mack	2	3	4	10	150,000	15,000
G. M. C.	1	2	3½	12	200,000	16,000
Fagiol	11	2	3	12	220,000	18,000

A sand and gravel contractor of Gowanda, N. Y., prefers heavy-duty trucks. His line up, comparable with that of the general contractor's above, is as follows:

	Age	Tonnage Rating	Load Cu. yd.	Truck Mileage	Per Year
Chevrolet	1/12	1½	2	1,000	12,000
Ford	2	1½	2	23,000	11,500
G. M. C.	2	3½-5	4	31,000	15,500
Chevrolet	3	1½	2	41,000	13,333
Stewart	4	5-7	5	60,000	15,000
G. M. C.	4	8-10	8	52,000	13,000
Mack	5	5	5	75,000	15,000
White	6	3½-5	4	79,000	13,167
Autocar	6	5	5	81,000	13,500

This contractor loads his trucks quite evenly at 0.974-cubic yard per ton rating. The moderation of this loading will be recognized at a glance. His nine trucks have traveled 13,500 miles per truck per year. He owns heavy-duty trucks and is sold on them.

Are Both Right?

Each of these contractors believes he knows which way profits lie as regards what trucks to use. Each appears to have had his equipment reasonably busy throughout their lives to date. And both are probably right.

There seem to be two determining factors in the selection of trucks. One of course is the type of service to which the contractor intends to put the truck and the second is the specifications of state highway departments regarding the maximum weight of trucks permitted on the subgrade. In the truck fleet of a general contractor who has a well-organized plan of action and an eye to profits will probably be found trucks of varying sizes, each selected because of the particular type of service it will best perform.

TABLE 1. Number of Trucks of Ton Ratings ½ to 10 Tons Purchased by 200 Contractors Since 1925

	½	¾	1	1½	2	2½	3	3½	4	5	6	6½	7	7½	8	10
1925	—	1	1	7	—	14	5	3	—	6	—	—	2	—	—	—
1926	—	—	—	—	—	7	4	—	—	2	—	—	—	—	—	—
1927	1	—	1	1	13	10	11	—	2	42	—	—	2	3	—	—
1928	2	1	1	4	3	6	6	4	5	3	1	—	1	1	—	—
1929	1	1	6	13	17	27	7	1	7	11	—	—	—	—	—	1
1930	1	8	4	25	10	12	34	16	—	9	1	1	4	—	—	2
1931	5	—	—	50	10	10	12	24	2	33	2	—	—	—	1	—
1932	8	—	2	58	22	13	8	6	3	7	—	—	—	10	—	1
1933	4	—	—	83	23	9	12	19	3	—	—	—	—	—	—	—
1934	8	—	1	168	15	8	7	9	—	1	—	1	—	—	—	12
1935	2	—	4	82	6	1	1	2	3	1	—	—	—	—	1	13
1936	1	—	—	32	6	1	week of January									
	33	11	20	523	125	118	107	84	25	105	4	2	9	14	2	29

New Link-Belt Distributor in Pacific Northwest

Announcement has been made by the Link-Belt Co., Chicago, Ill., of the appointment of the Feenaughty Machinery Co. as distributor for Link-Belt shovels, cranes and draglines in the Pacific Northwest territory. The Feenaughty headquarters are in Portland, Ore., with branches located in Seattle and Spokane, Wash., and Boise, Idaho. The organization is headed by W. O. Feenaughty, Pres.; J. I. Overman, Vice Pres.; D. J. Feenaughty, Secy.; and F. A. Kingston, Sales Mgr.

Increased employment was the dominant note in the Federal highway program for the year ending June 30, 1935. Directly and indirectly Federal highway activities accounted for more than 5,000,000 man-months of employment. The average full-time direct employment on road work involving Federal funds was 182,605 men or more than 2,000,000 man-months. Indirect employment has averaged approximately 1.4 times the direct employment, or more than 3,000,000 man-months.—Thomas H. MacDonald.

The Use of Asphalt Mattress for River Bank Protection

The development of the asphalt mattress for river bank protection was the subject of a paper presented by W. C. Carey, Senior Engineer, Second New Orleans District, U. S. Engineers Corps, at the meeting of the Mid-South Section of the American Society of Civil Engineers last May. Reprints of this paper have been issued by The Asphalt Institute as Bulletin No. 25.

The paper discusses the general problems of river bank protection work, prior uses and historical background of bitumen, the development of the asphalt mattress and the results of its use.

Copies of this bulletin may be secured gratis by interested contractors and engineers direct from The Asphalt Institute, 801 Second Ave., New York City, by mentioning this magazine.

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PAVER- Lays Velvet Smooth Road, 9 to 14 Feet Wide, at Lower Cost!
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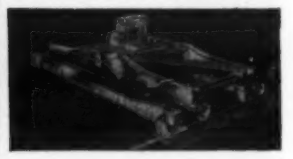

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WRITE FOR CATALOG 28

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In Spite of Temperatures of 33 Degrees Below—and Lower—the Counter Attack Against Snow Drifts Goes On. A Caterpillar Diesel Tractor and Large V-Type Snow Plow at Work in Fayette County, Iowa.

Drift Fighters

This winter, during which sleet storms, blizzards and record cold waves have been descending upon most of the country with such rapidity that even the most garrulous old-timers have been silenced on the subject of the "old-fashioned winters," the men of the hour have been the snow removal crews, upon whose loyalty and hardiness depended the welfare of hundreds, probably thousands, of the smaller communities in this country.

The work of the Nebraska State Highway Department crews brought forth the following tribute to their efforts which appeared as an editorial in the Lincoln, Nebr., *Star-Journal* of February 16. We are glad to reprint it here.

"After the late heavy snow and high winds, which blocked avenues of transportation, the state highway department crews found themselves, often, in the roles of explorers of new territory. While it was possible to communicate by telephone or telegraph, in most instances, the state highway department plows bought the first contact with the outside world to many towns.

"The highway crews, entering a town which had been isolated for several hours and in some cases of towns off the main highways two or three days, found some interesting situations. They discovered, for instance, that Nebraskans are less able to withstand the rigors of winter than in earlier days. For one thing, most isolated towns, if cut off for any time at all, were out of bread. Bread is perishable and never stocked in large quantities. The supply is shipped daily into small towns which boast no bakery. When the supply fails the town goes without bread. If isolation were to be extended home baking might be necessary, but few homes are supplied with flour in quantity, and yeast. Farmers were also hit by the bread shortage. They too depend upon the bakeries for their supply.

"Fuel shortage in some communities was a problem. In most cases, however, coal is stocked in rather large quantities and supplies are available. Moreover eastern Nebraska, where the drifting was the worst early last week, is not without its native supply of fuel.

"On the whole the highway department is proud of having kept the main lines of highway across the state open throughout the bad weather and of having all the principal roads open a short time after the storm had blown itself out. Department plows reached some towns to open the roads considerably before trains reached them. Crews worked day and night, in wind and low temperature, fighting the battle of the drifts to keep the roads open."

Index to A.S.T.M. Standards and Tentative Standards

The latest edition of the Index to A. S. T. M. Standards and Tentative Standards, which is invaluable in locating any particular standard or test method which has been covered in the various publications of the Society, has recently been published by the American Society for Testing Materials, 260 South Broad St., Philadelphia, Pa. This Index gives information on all of the 794 A.S.T.M. standards and tentative standards as of January 1, 1936.

Copies of this publication are furnished without charge on written request to the Society Headquarters at the above address.

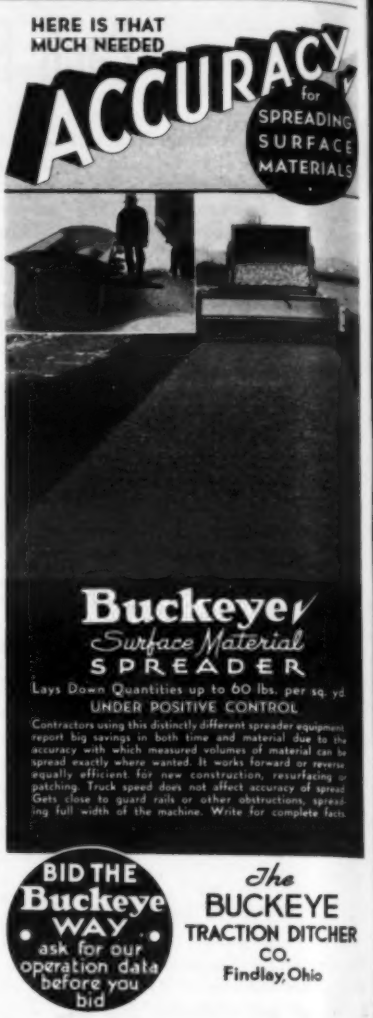
A.I.S.C. Announces Jury for Student Competition

The American Institute of Steel Construction has announced the names of the nationally known architects and engineers who will serve as judges in the eighth student bridge design competition held annually by the Institute. Students of engineering and of architecture in the colleges and technical schools of the United States are eligible to participate.

The problem is a design for a grade elimination overpass. Students may submit their preliminary designs for review by the jury on April 15, 1936, from which the ten best will be selected. These ten students will then make finished drawings which the jury will judge on May 13, 1936. The best of the final drawings will receive a cash prize of $100. The second best will be awarded $50 in cash. The prize winners and those receiving honorable mention will receive certificates of award signed by the jury which will consist of H. H. Allen, Vice President, J. E. Greiner Co., Consulting Engineers, Baltimore, Md.; Arthur G. Hayden, Designing Engineer, Westchester County Park Commission, White Plains, N. Y.; Theodore E. Blake, Architect, New York; Archibald Manning Brown, President, Architectural League of New York; and H. H. Saylor, Editor of *Architecture*.

Twenty-Two Foot Roads

Greater width of clearance is required for safety when traffic moves at high speed. There is also a greater reluctance of drivers to travel near the edge of the pavement, particularly if the shoulders of the road are soft. This leads to the conclusion that we must think of terms of 22-foot paved roads for two-lane highways.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Contractors using this distinctly different spreader equipment report big savings in both time and material due to the accuracy with which measured volumes of material can be spread exactly where wanted. It works forward or reverse equally efficient for new construction, resurfacing or patching. Truck speed does not affect accuracy of spread. Gets close to guard rails or other obstructions, spreading full width of the machine. Write for complete facts.
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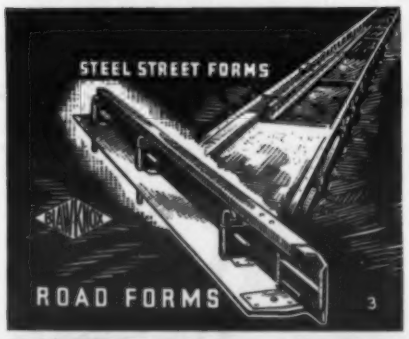

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With a background of years of practical experience, Blaw-Knox equipment is trustworthy. It is economical and low in maintenance. Designed to stand up under severe operating conditions, it is fitted to the job by skilled engineers. It helps immeasurably to fulfill contracts speedily and profitably.

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Offices and Representatives in Principal Cities

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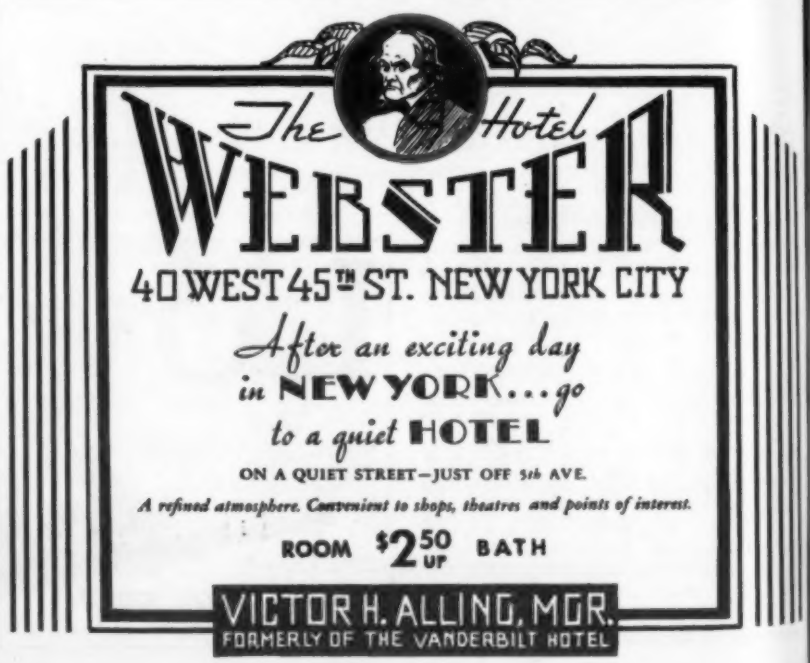
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Roads of Europe May Lead to War

(Continued from page 27)

roads, interest and amortization service amounting to 621,000,000 crowns. (The crown equals 3.3 cents at the present rate of exchange.) The present road program of Czechoslovakia is one of the most progressive in Europe.

In 1931 the Rumanian Government executed a contract with a Swedish company for the construction of main roads at a cost of approximately $21,400,000, the program to be completed in five years. In 1933, this contract was denounced by the Rumanian authorities and was revised in a manner more satisfactory to them. The cost of the work was reduced about 20 per cent and the time extended from five to eight years. A part of the work was transferred by the Swedish company to a French road-building company as well as to a number of Rumanian construction companies. Rumania has 84,851 miles of roads.

The Scandinavian Countries

With its 32,211 miles of roads, or about 2 miles of road to each square mile of area, Denmark has no definite construction plan, as its system has long been established and practically all of the work done on roads in that country is maintenance.

About half of Finland's system, or nearly 20,000 miles, is under the jurisdiction of the Central Government, its supervision being exercised by the Highways and Waterways Section of the Ministry for Communications and Public Works. Practically all of the roads are gravel-surfaced. The other half of the roads are maintained by the communes and villages and are mostly surfaced with earth and gravel. The income from various tax sources in 1934 just about offset the expenditures of the Government for road purpose, about 183,365,000 marks. (The Finnish mark equals 2.2 cents.)

Most of the work on Norway's 24,000 miles, most of which are of gravel and improved earth, is done by the Bureau of Roads rather than by contractors. The appropriation for the year ending June 30, 1935 was 22,447,000 crowns, the crown equalling 2.5 cents.

Sweden has a highway system totaling 86,395 miles, most of which is surfaced with ordinary gravel and macadam.

Other Countries

The Netherlands road system totals 15,959 miles, practically all of which is improved with a high type of macadam or gravel surface. The number of miles of road per square mile of area in the Netherlands, 0.9, approximates that of the United States. However, the number of motor vehicles to one mile of road is greater. The expenditures for highway purposes by the National Government in 1935 was estimated to be 22,650,000 florins (the florin equals 67.5 cents). About 64 per cent of the funds come from road tax and 33 per cent from bicycle tax, less than 3 per cent from the general fund and the remainder from capital expenditures. The Netherlands Government is engaged in carrying on a plan of road improvement adopted in 1934, which calls for extensive bridge building and reconstruction of the present highway system.

There are 10,180 miles of roads in Switzerland, none of which are classed as national as the highways of that country are under the jurisdiction of the separate cantons. About 31 per cent of the entire mileage has dust-free surfaces, the other two-thirds is improved and unimproved earth, with some sand-clay and gravel. While the roads are under the jurisdiction of the cantons, the Swiss Constitution grants supervisory powers to the Federal Government in regard to roads and bridges and the regulation of motor traffic. The actual construction, maintenance and administration of all Swiss roads come directly within the jurisdiction of the cantons.

Women Share the Burden of Road Building in Portugal. A 14-year-old Girl Pushing a Wheelbarrow of Stones for the Road for 15 Cents Per 12- to 14-Hour Day.

An elaborate road building program was inaugurated in Greece in 1928 but came to an abrupt end in 1932. During that four-year period, over $12,000,000 had been spent in starting an ambitious construction program, largely on new mountain highways. More than a thousand miles of such had been started and were left unfinished in such condition that they could not be opened to traffic without additional outlay. Practically all highway work was suspended until 1933, when the original contract with a Greek company was cancelled. In September 1934 a new contract had been signed by the Greek Government and the original Greek company organized under a new name, and at present this company is working under a three-year program started in September 1934. The total cost of this work is estimated at $5,000,000. Under a new program, adopted in 1935, it is estimated that about 2,000 miles of new roads will be added to the present network at a total outlay of about $8,000,000. The greatest highway need of Greece is an improved system of maintenance. The highway systems totals 7,320 miles.

Portugal announced in 1933 a ten-year program of highway improvement, which provides for the expenditure of 1,000,000 contos ($45,000,000) for the construction and maintenance of highways. The Government estimated that there would be 713 miles of new construction, 2,188 miles of major repairs, 186 miles to be paved with stone, and 496 miles to be paved with asphalt surface.

Much of the data in this article and the following statistics were furnished by the Bureau of Foreign and Domestic Commerce.

Area and Road Mileage

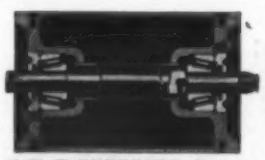
Country	Area Sq. Miles	Road Mileage	Area to 1 Mile of Road
Aegean Islands	977	249	3.9
Albania	17,374	1,116	15.6
Austria	32,372	23,370	1.4
Azores	924	600	1.5
Belgium	11,754	18,956	0.6
Bulgaria	39,825	15,317	2.6
Cyprus	3,584	2,906	1.3
Czechoslovakia	54,196	43,169	1.2
Danzig	630	1,247	0.7
Denmark	16,574	32,211	0.5
Estonia	18,376	13,489	1.4
Finland	132,597	39,423	3.4
France	212,736	393,761	0.5
Germany	180,989	216,674	0.8
Gibraltar	3	16	0.1
Great Britain	89,041	177,822	0.5
Greece	50,270	7,320	6.9
Hungary	35,911	18,068	2.0
Iceland	39,709	2,112	18.8
Irish Free State	26,935	48,054	0.6
Italy	119,744	105,810	1.1
Latvia	25,402	20,967	1.2
Lithuania	21,490	27,496	0.8
Luxembourg	999	2,545	0.4
Malta and Gozo	122	584	0.2
Netherlands	13,213	15,969	0.9
Northern Ireland	5,237	12,997	0.4
Norway	125,617	24,295	5.2
Poland	149,937	140,980	1.1
Portugal	35,796	19,262	1.9
Rumania	113,887	84,951	1.3
Russia (Inc. Asiatic Russia)	8,241,921	1,682,109	4.9
Spain	195,040	70,760	2.7
Sweden	173,143	86,395	2.0
Switzerland	15,944	10,180	1.6
Yugoslavia	96,737	25,170	3.8
Total	10,299,205	3,386,330	3.0

A Full-Revolving ⅜-Yard Convertible Crawler Shovel

The new Model 20 full-revolving ⅜-yard convertible shovel announced by Bay City Shovels, Inc., Bay City, Mich., has a working weight of 10 tons. It can handle a 4-ton crane load safely and the manufacturer emphasizes that it is "distinctly out of the toy class." The machine is built compactly yet with plenty of elbow room. Useless dead weight is eliminated by the use of alloy steels and heat treating; anti-friction bearings save lubrication and wear; it is equipped with a chain crowd, drop-forged crawler shoes 14 inches wide, a unit-cast car body and machinery table of nickel-manganese steel, totally heat treated, either 6-cylinder gasoline or diesel power, cut helical gears, a safety worm boom hoist and a positive propelling lock.

The shovel boom is 15 feet long and the clam-drag boom 25-30 feet in length. The shovel bucket is full ⅜-yard with a cast back, nickel chrome front and renewable reversible points. Any standard ⅜-yard dragline and clamshell buckets can be used with the machine and ditcher buckets of 18, 24 and 30-inch widths. Operated as a crane it handles a 4-ton hook and block. There are only three operating levers all located within easy reach in the operator's seated position. The machine has two propelling speeds 1 mph and 2½ mph and a swing speed of 5 rpm.

Power is furnished by a 6-cylinder Hercules JXC 45-hp motor operating at 1,400 rpm or a 6-cylinder International FBB 47-hp motor operating at 1,400 rpm, a 25-hp electric motor of any standard make or a 6-cylinder Hercules diesel DJXB rated at 47 hp at 1,400 rmp.



Adjustable bearings locked into pulleys take radial and thrust loads. Furnished with either Ball or Roller Bearings.

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Conweigh presents an advanced design which provides the ultimate in economy performance and service . . . Write for new Catalog describing the complete Conweigh Line . . . Our line of Portable and Semi Portable Conveying equipment is described in our Catalog of "Porta Conveyors."

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A POWERFUL TWO-PURPOSE TOOL
for heavy demolition and sheeting work...

- Hits a hard slugging blow
- Easy to operate
- Does not wear operator down
- Low air consumption
- Built for long life

The WORTHINGTON No. 10 MASTER BREAKER and SHEETING DRIVER

INTERCHANGEABLE HEADS . . . for breaking or driving

The change from one type of tool to the other is quickly made by removing two head bolts.

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Now that they've stood the test of time . . . ACE JOINTS have entirely justified the approval they have been accorded by State and County Highway Engineers as well as by the U. S. Bureau of Public Roads! When this is considered, together with the time, effort and money-saving advantages they offer contractors, it is little wonder that ACE JOINTS are being specified and used on a steadily increasing number of projects, the country over.

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Constructing Stabilized Roads

623 A new booklet "Stabilized Roads" which contains the latest "dope" on a practical and economical method of stabilizing gravel roads with clay and calcium chloride or common salt has just been issued by the Pioneer Gravel Equipment Mfg. Co., 1515 Central Ave., Minneapolis, Minn., from whom copies may be secured without obligation.

Making Trench Work Safe

624 Complete information on Kalamazoo trench braces, which are strong, rugged and made to stand rough usage and are designed to make each job a safe one, may be secured from the Kalamazoo Foundry & Machine Co., 600 E. Michigan Ave., Kalamazoo, Mich.

Manual of Concrete Curing

625 Copies of this booklet which contains valuable data gathered from many sources on the proper curing of concrete may be secured gratis from the Columbia Alkali Corp., Barberton, Ohio by mentioning this magazine.

Explosives and Blasting Supplies

626 A new 48-page booklet describing Hercules explosives and blasting supplies and their many uses may be secured by those interested from the Hercules Powder Co., Inc., Wilmington, Dela.

Machinery for Roads and Street

627 White machinery for the construction and maintenance of roads and streets, including tar and asphalt heating kettles, repair plants, patchers, portable asphalt plants, concrete mixer heaters, tool and surface heaters, vibrators and grinders, emulsion sprayers, bituminous pre-mixing plants and traffic line markers, is described in Catalog No. 25 which may be secured upon request from the White Mfg. Co., Elkhart, Ind.

A New Dredging Bucket

628 A new Williams dredging bucket of the Champion series, in an entirely new design and ranging in size from ½ to 3 cubic yards, is fully described and illustrated in Bulletin P3-43, a copy of which may be secured upon request from the Wellman Engineering Co., 7012 Central Ave., Cleveland, Ohio.

Finisher-Spreaders for Road Construction

629 The Blaw-Knox Finish-Spreader for spreading bituminous mixtures in layers from ½-inch to any thickness desired as well as for spreading gravel, slag, crushed stone and other road paving materials, is described and illustrated in Bulletin No. 1523 which the Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh, Pa., will send on request.

Road Machinery Reference Catalog

630 The complete line of Austin-Western road machinery is described and illustrated in its new 1936 Pictorial Reference Catalog No. 1475, copies of which are available by writing direct to the Austin-Western Road Machinery Co., Aurora, Ill.

Filters for Crankcase Oil

631 Skinner Purifiers, Inc., 2231 Dalzelle St., Detroit, Mich., will be glad to send to those interested literature describing its Stream-Line filters, the use of which is claimed to save from 40 to 60 per cent of the oil bill by removing the impurities in crankcase oil.

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632 Allis-Chalmers oil tractors which burn low-cost diesel fuel and have the simplicity of a gasoline-driven tractor are described in literature which the Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee, Wis., will be glad to send on request.

Dirt Handling Equipment

633 Parsons trench excavators, trench backfillers, terracing graders and road reclaimers are described in literature which the Parsons Co., Newton, Iowa, will be glad to send on request.

Vibrators for Concrete

634 Mall vibrators for placing concrete to secure a dense, strong concrete with a minimum of pockets, are described in literature which the Mall Tool Co., 7743 So. Chicago Ave., Chicago, Ill., will be glad to send on request, together with suggestions for the proper Mall machine for your job.

For Your Drainage Problems

635 Complete information on Gohi corrugated metal culverts, features of which are its long life, and resistance to corrosion, may be secured by interested contractors and engineers from Gohi Culvert Manufacturers, Inc., Newport, Ky.

Removing the Bumps from Pavements

636 The H & H Mfg. Co., Elyria, Ohio will be glad to furnish complete information on the Hill surfacer for removing the bumps from concrete and bituminous pavements.

Sand and Gravel Plants

637 Good Roads Machinery Corp., Kennett Square, Pa., will be glad to furnish complete information on Good Roads sand and gravel plants, either portable or stationary, for producing small or large sizes, to meet the requirements of your job.

Electric Welding Products

638 Electrodes, arc welding machines, and miscellaneous apparatus used by contractors in arc welding are described and illustrated completely in a recently issued 32-page book, Catalog No. 101, which may be secured from G. Van Alstyne, Advertising Manager, Air Reduction Sales Co., 60 E. 42nd St., New York City.

Complete Line of 1936 Trucks

639 Complete information on the 1936 line of GMC trucks, from ½ to 6-ton capacities, with many cost-reducing improvements and features, may be secured by interested contractors and engineers from the General Motors Truck Co., Pontiac, Mich.

Diesel Power in Cold Weather

640 Cummins Engine Co., 601 Wilson St., Columbus, Ind., will be glad to send to those interested a copy of "Read the Record" containing complete information on cold-starting Cummins diesel engines for powering construction equipment.

Tractors for Road Builders

641 International Harvester Co., Inc., 606 So. Michigan Ave., Chicago, Ill., will be glad to send to interested road builders complete information on the International Trac-TracTor for furnishing power on dirt moving and other jobs.

Rope for Construction Equipment

642 Williamsport Wire Rope Co., 122 So. Michigan Ave., Chicago, Ill., will be glad to send to those interested complete information on Form-Set, Williamsport's method of preforming wire rope to provide stamina, endurance, ease of handling and long life.

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Look at this UNMATCHED RECORD *then let* CHEVROLET TRUCKS *reduce your haulage costs*

Location of Test	Los Angeles to New York
Distance Traveled	3511.5 miles
Running Time	129 hours, 24 minutes
Average Speed	27.14 miles per hour
Gasoline Used	308.6 gallons
Gasoline, miles per gallon	11.378
Oil Consumption	2 quarts
Cost of Fuel	$57.59
Cost of Oil	$.67
Fuel and Oil (cost per mile)	$.016
Average cost per ton mile	$.00328
Water Consumption	1 gallon

No mechanical failures

Entire test conducted under supervision of A.A.A. Contest Board—Sanction No. 3300.

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NEW PERFECTED HYDRAULIC BRAKES always equalized for quick, unswerving, "straight line" stops.

NEW HIGH-COMPRESSION VALVE-IN-HEAD ENGINE with increased power, increased torque, greater economy in gas and oil.

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The accompanying picture and record of this unusual test run with a Chevrolet truck give indisputable proof of every claim ever made for the power and economy of Chevrolet trucks.

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Get the facts with trial loads—your kind of loads—under conditions that can leave no doubt concerning Chevrolet truck superiority for your haulage needs. Your Chevrolet dealer is ready to give you that test—at your convenience.

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6% **NEW MONEY-SAVING G. M. A. C. TIME PAYMENT PLAN** *Compare Chevrolet's low delivered prices and low monthly payments.*

Getting Ready for the Spring Push

643 American Hoist & Derrick Co., St. Paul, Minn., suggests that now is the time to make plans and select new up-to-date equipment for the big contracts which will start this spring. Copies of the latest catalog of this company, containing complete information on the American line of excavators, will be sent upon request.

Portable Crushing Plant with Diesel Power

644 The new Iowa Super Straight Line portable crushing and screening plant which is equipped with diesel power is described and illustrated in the Super Straight Line Bulletin which the Iowa Mfg. Co., Cedar Rapids, Iowa, will be glad to send to readers of this magazine upon request.

An All-Purpose Heavy-Duty Trailer

645 Complete details on the LaCrosse all-purpose trailer, in capacities of 5 to 50 tons, features of which are low loading platform, pneumatic tires, and low operating cost, may be secured by those interested from the C. R. Jahn Co., LaCrosse, Wis.

More 1936 Motor Trucks

646 Complete information on the new 1936 Dodge motor truck, features of which are its economical operation, fore point load distribution, genuine hydraulic brakes, new styling and low price, may be secured from Dodge Bros. Div., Chrysler Corp., Detroit, Mich.

Road and Street Equipment

647 Municipal Supply Co., South Bend, Ind., will be glad to send on request its new literature on South Bend bituminous distributors, street flushers and sprinklers, and traffic line markers to state and county highway engineers and contractors.

A Tractor Dump Wagon

648 The Camel tractor dump wagon, combining the features of truck, tractor, trailer and bulldozer, is described in literature which the Shunk Mfg. Co., Dept. 36, Bucyrus, Ohio, will be glad to send on request.

Steel for Highways

649 Truscon Steel Co., Youngstown, Ohio, will be glad to send to interested contractors and engineers complete information on its line of Truscon reinforcing steel, contraction and expansion joints, dowel bar chairs and road forms for the construction of concrete roads.

New Truck Shovel

650 Complete information on the new Michigan Model T6 truck shovel, features of which are the fingertip clutch control, modern design, mobility, and easy convertibility, may be secured upon request from the Michigan Power Shovel Co., Benton Harbor, Mich.

Carrying Load Across Highway Joints

651 The J-Bar Catalog, containing the latest data on highway load transmission and describing the J-Bar device for carrying the load across all types of highway joints, may be secured upon request from the J-Bar Co., 121 W. Wacker Drive, Chicago, Ill.

Diesel-Powered Water-Cooled Compressors

652 A water-cooled air compressor with a 50 per cent cooler discharge temperature for the air, lower lubricating oil consumption and a diesel engine for power that saves 60 to 75 per cent of fuel costs is described in the literature of Gardner-Denver Co., 102 Williamson St., Quincy, Ill.

Idlers and Accessories for Conveyors

653 The Conweigh line of dependable, antifriction troughing and return idlers, trippers and accessories are described in literature which the Portable Machinery Co., Div. of A. B. Farquhar Co., Ltd., Box C-1, York, Pa., will be glad to send on request.

Power Unit for Preparing Subgrade

654 The R-B Power Finegrader, which cuts the grade, removes excess soil and smooths the subgrade ready for pouring the concrete, is described in literature which the R-B Equipment Mfg. Co., 720 E. New Hampshire St., Royal Oak, Mich., will be glad to send on request.

Diesel Tractors for Heavy Jobs

655 Complete information on Caterpillar diesel tractors and their use on the big dirt-moving jobs may be secured by interested contractors direct from the Caterpillar Tractor Co., Peoria, Ill.

Power for Construction Equipment

656 Bulletin No. 540, describing Waukesha Super-Four engines, which are built in three sizes from 80 to 120 hp, for powering construction equipment, may be secured by interested contractors from the Waukesha Motor Co., Waukesha, Wis.

Black Top Laid To Line and Specified Thickness

The Adnun self-powered black top paver may be steered by its operator through the two front wheels which with the rear rollers are powered to insure a uniform forward movement while spreading. The machine has three speeds forward and reverse, the working speeds being 10 and 25 feet a minute and the traveling speed 150 feet per minute.

Two special features of this black top spreader made by the Foote Co., Inc., Nunda, N.Y., are the cutter bar and the power cut-off. The accuracy of the thickness of material spread is due to the cutter bar which is a moving blade like that of a mower, moving back and forth to give a positive strike-off. The teeth are beveled on the under side, giving a crowding action on the material in the form of an initial compression which compacts materials in holes. The edge of the course is determined by an edger plate which leaves a firm true edge.

The power cut-off is a positive closing door which shuts off the flow of the mix to the subgrade under the control of the operator at all times. This makes it possible to continue spreading a mix right up to an intersection, then shutting off the material while the intersection is crossed and continuing on the other side.

Any type of bituminous material is fed to the hopper of the Adnun black top paver direct from the tail board of a motor truck. The hopper may be filled and then the truck driven away or the feed may be continuous with the truck keeping just ahead of the paver itself.

New Sheepsfoot Roller Has Oscillating Sections

The sheepsfoot roller has come into its own with the large number of earth dams constructed in the past few years. A new roller of this type but with oscillating sections so that it effectively compacts uneven surfaces has been developed by Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh, Pa. The two segments are divided at the center of the roll and pivoted in frames so that they operate entirely independently.

The new tamping roller has an outside diameter of 52½ inches, weighs 6,885 pounds empty and 10,500 pounds when filled with water. Cleaning teeth are set into the rear of each frame as regular equipment and holes are provided in the front of the frame for attaching an extra set of teeth when desired. The individual tamping feet are 7½ inches long.

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THERE are three features a Pressure Distributor must have in order that you may expect dependable and efficient performance . . . Ability to heat quickly and efficiently—Simplicity of construction and operation—Accuracy of application . . . Be sure when you look at distributors to investigate these points carefully . . . These factors predominate in the construction and operation of Littleford Model "C" Pressure Distributors . . . The best way to become familiar with the standard by which to judge is to write—at once—for prices and descriptive literature on distributors "built by Littleford."

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- —on the most economical and practical method of stabilizing gravel roads with clay and calcium chloride or salt.
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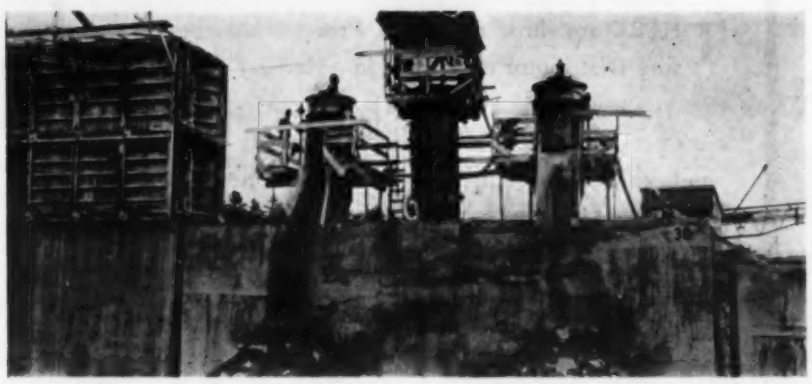
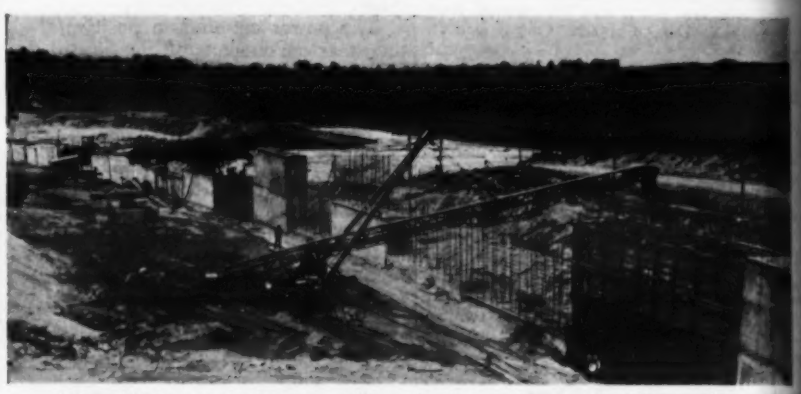
Contractors and Engineers Monthly

A Winding Road Which Parallels the Railway from Menton to Sospel in the South of France. See Page 15.

U. S. Engineer Dept., Los Angeles, Calif., Used This Bay City Model 62 1-Yard Machine Powered with a Hercules Diesel Engine to Excavate for the East Side of the Flood Control Channel in Glendale, Calif., Where Disastrous Floods Occurred a Year Ago. See Page 2.



Dumping from One of the Material Locks on Caisson No. 30 at Quabbin Dam near Enfield, Mass., for Boston's New Water Supply from Swift River.



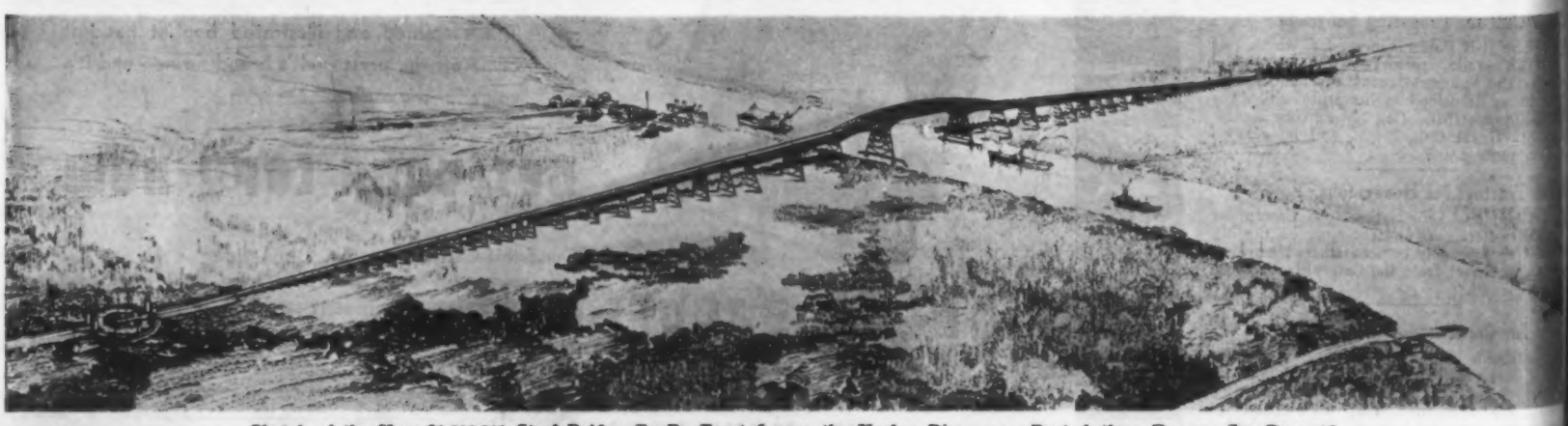
A Portable Conveyor Pouring a Lift on Another Caisson on the Metropolitan District Water Supply Commission Project at Enfield. See Page 1.

The West End of an Unusual Steel Overpass on U.S. Route 24 East of Kansas City, Mo. See Page 5.

High Stepping on a Big Drift Opened Up by North Dakota State Highway Department Plows One Mile South of Wilton. The Methods of Snow Removal Used by This State Are Described on Page 8.

Heavy-Duty Equipment Moving Dirt at Clendening Dam in Eastern Ohio. See Page 11.

Tractor and Dollie Move Grange Hall. See Page 23.



Sketch of the New $2,500,000 Steel Bridge To Be Erected over the Neches River near Port Arthur, Texas. See Page 16.